



**RECEIVED**  
**FEB 02 2011**  
**COGCC**

**SUNDRY NOTICE**

Submit original plus one copy. This form is to be used for general, technical and environmental sundry information. For proposed or completed operations, describe in full on Technical Information Page (Page 2 of this form.) Identify well or other facility by API Number or by OGCC Facility ID. Operator shall send an informational copy of all sundry notices for wells located in High Density Areas to the Local Government Designee (Rule 603b.)

1. OGCC Operator Number: <b>66571</b>	4. Contact Name <b>Daniel I. Padilla</b>	Complete the Attachment Checklist  OP OGCC
2. Name of Operator: <b>OXY USA WTP LP</b>	Phone: <b>970.263.3637</b>	
3. Address: <b>760 Horizon Drive, Suite 101</b>	Fax: <b>970.263.3694</b>	
City: <b>Grand Junction</b> State: <b>CO</b> Zip: <b>81506</b>		
5. API Number <b>05-</b>	OGCC Facility ID Number	Survey Plat
6. Well/Facility Name: <b>Cascade Creek 609-14</b>	7. Well/Facility Number <b>336005</b>	Directional Survey
8. Location (Qtr/Qtr, Sec, Twp, Rng, Meridian): <b>SWSW, Sec 9, T6S, R97W, 6th PM</b>		Surface Eqmpt Diagram
9. County: <b>Garfield</b>	10. Field Name: <b>Grand Valley</b>	Technical Info Page <input checked="" type="checkbox"/>
11. Federal, Indian or State Lease Number:		Other Drill Cuttings Plat <input checked="" type="checkbox"/>

**General Notice**

<input type="checkbox"/> <b>CHANGE OF LOCATION:</b> Attach New Survey Plat (a change of surface qtr/qtr is substantive and requires a new permit)	
Change of Surface Footage from Exterior Section Lines:	FNL/FSL <input type="checkbox"/> FEL/FWL <input type="checkbox"/>
Change of Surface Footage to Exterior Section Lines:	<input type="checkbox"/>
Change of Bottomhole Footage from Exterior Section Lines:	<input type="checkbox"/>
Change of Bottomhole Footage to Exterior Section Lines:	<input type="checkbox"/>
Bottomhole location Qtr/Qtr, Sec, Twp, Rng, Mer	attach directional survey
Latitude	Distance to nearest property line
Longitude	Distance to nearest bldg, public rd, utility or RR
Ground Elevation	Distance to nearest lease line
	Is location in a High Density Area (rule 603b)? Yes/No <input type="checkbox"/>
	Distance to nearest well same formation
	Surface owner consultation date:
<b>GPS DATA:</b>	
Date of Measurement	PDOP Reading Instrument Operator's Name
<input type="checkbox"/> <b>CHANGE SPACING UNIT</b>	
Formation	Formation Code Spacing order number Unit Acreage Unit configuration
<input type="checkbox"/> Remove from surface bond	
<input type="checkbox"/> Signed surface use agreement attached	
<input type="checkbox"/> <b>CHANGE OF OPERATOR (prior to drilling):</b>	
Effective Date:	
Plugging Bond: <input type="checkbox"/> Blanket <input type="checkbox"/> Individual	
<input type="checkbox"/> <b>CHANGE WELL NAME</b> NUMBER	
From:	
To:	
Effective Date:	
<input type="checkbox"/> <b>ABANDONED LOCATION:</b>	
Was location ever built? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Is site ready for inspection? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Date Ready for Inspection:	
<input type="checkbox"/> <b>NOTICE OF CONTINUED SHUT IN STATUS</b>	
Date well shut in or temporarily abandoned:	
Has Production Equipment been removed from site? <input type="checkbox"/> Yes <input type="checkbox"/> No	
MIT required if shut in longer than two years. Date of last MIT	
<input type="checkbox"/> <b>SPUD DATE:</b>	
<input type="checkbox"/> <b>REQUEST FOR CONFIDENTIAL STATUS</b> (6 mos from date casing set)	
<input type="checkbox"/> <b>SUBSEQUENT REPORT OF STAGE, SQUEEZE OR REMEDIAL CEMENT WORK</b> *submit cbl and cement job summaries	
Method used	Cementing tool setting/perf depth Cement volume Cement top Cement bottom Date
<input type="checkbox"/> <b>RECLAMATION:</b> Attach technical page describing final reclamation procedures per Rule 1004.	
Final reclamation will commence on approximately	<input type="checkbox"/> Final reclamation is completed and site is ready for inspection.

**Technical Engineering/Environmental Notice**

<input type="checkbox"/> <b>Notice of Intent</b>		<input type="checkbox"/> <b>Report of Work Done</b>	
Approximate Start Date:		Date Work Completed:	
Details of work must be described in full on Technical Information Page (Page 2 must be submitted.)			
<input type="checkbox"/> Intent to Recomplete (submit form 2)	<input type="checkbox"/> Request to Vent or Flare	<input type="checkbox"/> E&P Waste Disposal	
<input type="checkbox"/> Change Drilling Plans	<input type="checkbox"/> Repair Well	<input checked="" type="checkbox"/> Beneficial Reuse of E&P Waste	
<input type="checkbox"/> Gross Interval Changed?	<input type="checkbox"/> Rule 502 variance requested	<input type="checkbox"/> Status Update/Change of Remediation Plans	
<input type="checkbox"/> Casing/Cementing Program Change	<input type="checkbox"/> Other:	for Spills and Releases	

I hereby certify that the statements made in this form are to the best of my knowledge, true, correct and complete.

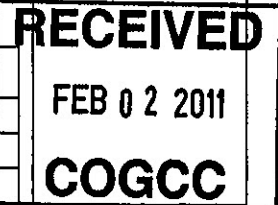
Signed: *Daniel I. Padilla* Date: 1/31/11 Email: daniel\_padilla@oxy.com  
Print Name: Daniel I. Padilla Title: Regulatory Advisor

COGCC Approved: *[Signature]* Title: Environ. Sup. Date: 4-22-11  
CONDITIONS OF APPROVAL IF ANY:

TECHNICAL INFORMATION PAGE



FOR OGCC USE ONLY



1. OGCC Operator Number: 66571 API Number: \_\_\_\_\_
2. Name of Operator: OXY USA WTP LP OGCC Facility ID # \_\_\_\_\_
3. Well/Facility Name: Cascade Creek 609-14 Well/Facility Number: 336005
4. Location (QtrQtr, Sec, Twp, Rng, Meridian): SWSW, Sec 9, T6S, R97W, 6th PM

This form is to be completed whenever a Sundry Notice is submitted requiring detailed report of work to be performed or completed. This form shall be transmitted within 30 days of work completed as a "subsequent" report and must accompany Form 4, page 1.

5. **DESCRIBE PROPOSED OR COMPLETED OPERATIONS**

OXY USA WTP LP (Oxy) proposes to permanently dispose of drill cuttings at the Oxy 609-14 Annex Pad. The cuttings will be generated from drilling activities located at Oxy's 609-14, 608-43-31, 609-33, and 697-15-01 pads. Oxy has prepared the attached Drill Cuttings Materials Management Plan outlining its cuttings disposal and storage plan at the 609-14 Annex pad. All activities are located on Oxy property.

Oxy requests review and if appropriate, approval of the proposed cuttings disposal plan.

Copy



## Fischer, Alex

---

**From:** Daniel\_Padilla@oxy.com  
**Sent:** Tuesday, April 19, 2011 4:15 PM  
**To:** Fischer, Alex; Sean\_Norris@oxy.com  
**Cc:** Blair\_Rollins@oxy.com; Brad\_Ahlquist@Oxy.com; John\_Ocana@oxy.com; Warner\_Meece@oxy.com; Douglas\_Weaver@oxy.com; Craig\_Richardson@oxy.com; Joan\_Proulx@oxy.com  
**Subject:** Oxy's Response to COGCC Questions and Comments: RE: Cascade Creek 609-14 Drill Cuttings Materials Management Plan  
**Attachments:** Oxy 609-14 Annex Cuttings Final Cuttings Plan rev.4.19.11.pdf; 609-14 cuttings plan support map\_small.pdf; 609-14 Form 2A Approved.pdf

Alex.

Thank you for your comments and questions. Oxy had responded to each question and comment below and has included additional maps and a revised Cuttings Materials Management Plan. Oxy's comments are denoted with double "\*\*\*" at the beginning and end of each comment; comments will also be in "blue".

Oxy requests your review of the revised cuttings plan, associated responses below, and support documentation. If appropriate, please approve the plan so that Oxy may implement the drill cuttings material management plan. Note that if approved, Oxy will use this template to revise it's proposed 15-01 and Mesa cuttings plans.

Please let me know if you have any questions, comments, or if you require additional information,

Thanks,

Daniel

Daniel I. Padilla  
Regulatory Advisor  
OXY USA WTP LP and  
OXY USA Inc.  
Occidental Oil and Gas Corporation  
760 Horizon Drive, Suite 101  
Grand Junction, CO 81506  
970.263.3637 - office  
970.263.3694 - fax  
daniel\_padilla@oxy.com

Daniel,

I have outlined comments and some questions regarding the Cascade Creek 609-14 Drill Cuttings Materials Management Plan. I feel that these comments and questions are for all parties to consider the ultimate disposition of the cuttings and potential long term effects in implementing the Cutting's Materials Management Plan.

In the Drill Cuttings Materials Management Plan it is stated that:

- Each well will generate approximately 218 cubic yards of material and then blended with sawdust, there will be an expansion of approximately 330 cubic yards; \*\*The 330 cubic yards is a conservative estimate, based on a semi-closed loop system. We are now employing a closed loop system which is generating less cuttings. Oxy is still assessing the new total estimate of cuttings being generated per well with the new system and will provide that information to the COGCC as soon as it becomes available. Note that Oxy will now have eight shakers and two centrifuges for each drill rig, further reducing the amount of cuttings generated for disposal. The original cuttings plan called for 4 shakers and one centrifuge.\*\*

- The composite sample will consist of cuttings taken from at least five random locations of the mixed cuttings pile; and
- One composite sample from cuttings of each individual well drilled will be analyzed for COGCC Table 910-1 constituents;

The COGCC feels that this is not a sufficient number of samples to adequately characterize the materials should be collected. Although the COGCC does not have specific guidance of what is adequate for the number of samples collected and analyzed, we feel that one per 330 cubic yards may not be adequate. That equates to one sample per 66 truck loads using a five-yard dump truck as you indicated. \*\*Oxy has amended its cuttings management plan to reflect the changes discussed by you and Sean Norris, Oxy Regulatory Lead, see attached. Oxy's air drilling method and closed loop system will ensure that clean cuttings are being generated. However, to ensure that the cuttings are hydrocarbon free or that only *de minimus* amounts (below table 910-1) are present, each sample will be analyzed for Table 910-1 which includes TPH. Oxy anticipates using analytical data generated to develop statistical trends for either decreasing or increasing sampling frequency. In general, Oxy is hauling approximately 16 cubic yards every dump truck load; translating into approximately 21 truck loads as opposed to 66 truck loads. We anticipate that the amount of truck traffic will decrease with the implementation of a closed loop system.\*\*

Total of about 22,440 cubic yards of cutting (expansion included) would be generated during the drilling of all wells.

Please indicate on map the locations cuttings will originate from and provide the Location ID and legal, QTR/QTR, Section, Township and Range:

- 608-41 = 22 wells;
- 608-43-31 = 17 wells;
- 609-33 = 20 wells; and
- 697-15-01 = 9 wells \*\*See attached map.\*\*

Include on this map the 609-14 Annex pad and the Mesa Cutting Disposal Area (MCDA). \*\*See attached map.\*\*

Where is the 697-15-01 pad in relation to the 609-14 Annex Pad? \*\*See attached map.\*\* This transfer route crosses the Cascade Canyon unnamed drainage. \*\*Correct. The existing access road crosses an unnamed drainage to Cascade Canyon as well as the head waters of Cascade Canyon. Any accidents or spills associated with transport trucks will be responded to and if appropriate will be reported to the COGCC in accordance with the 900 Series Rules. Reporting to additional agencies will be assessed on a case by case basis.\*\*

Has Oxy determined if the 609-14 Annex pad is located in a sensitive area? \*\*Oxy prepared and submitted (2/11/10) a Form 2A for the 609-14 Annex pad. Regarding Section 14 Water Resources (Rule 901.e) we noted that the location was not in a sensitive area. The Form 2A, was approved by the COGCC on 3/30/2010, see attached.\*\*

#### Surface Water Monitoring and Features:

The Drill Cutting Management Plan Laboratory Data lists metals that were detected in drill cuttings. Although these are below the 910-1 Table Concentration Levels:

- Would sampling and analyzing for dissolved metals in the stock pond be appropriate to establish baseline conditions? \*\*Oxy will include dissolved metals sampling and analysis for the stock pond.\*\* ✓
- While establishing the background water quality, TPH should be included to the proposed list of analytes. \*\*Oxy will test for Table 910-1, and will include TPH and dissolved metals for samples collected at the storage pond.\*\*
- OXY indicates that quarterly sampling of the stock pond would be performed during disposal operations and continue for 4 quarters following capping and completion of the disposal operations. \*\*Yes, Oxy will attempt to

sample every quarter, environmental conditions permitting. Should inclement weather, including severe storms or accumulated snow prevent access to the location, Oxy will reschedule a sampling event at the next available opportunity.\*\*

- There appears to be tributary flowing to Conn Creek to the west of the 609-14 Annex and a tributary flowing to Canyon Creek to the east of the 609-14 Annex. \*\*We concur, but these tributaries are located in other drainages and are not down stream of Oxy's 609-14 pad. See topographic map submitted in the original cuttings management plan.\*\*

The Walsh Environmental Scientists and Engineers, LLC (Walsh) report addresses some soil and geologic data. Are there:

- Local and regional geologic structures; and \*\* Sec. 2.1 of the Hydrogeologic Report on the #609-14 Well Pad (Regional Geology) mentions the regional setting of the site on the Colorado Plateau, southwest of White River Uplift. Section 2.2 of the report (Site Geology) is more specific about the local stratigraphy and bedrock which outcrops in stream floors in the area.\*\*
- Any geologic hazards that may affect the design and operation of the facility. \*\*Based on review of Garfield County Geologic Hazard reports, no known geologic hazards such as faults or slump features, slump-prone soils, etc. are known to be in the area of the #609-14 pad. \*\*

The Walsh report addresses some hydrologic data. What are/is:

- surface water features within two (2) miles; \*\*Per our phone conversations, we have limited our review to "within ¼ mile" of the 609-14 pad. Section 2.4 (Site Hydrology) mentions the nearest ephemeral stream being about 900 feet horizontally south and 200 feet vertically below the pad – this is the only reference to surface water features within 2 miles; Cascade Canyon is approximately 3,400 feet east-southeast of the site, slightly downslope, an ephemeral stream is located approximately 1,200 feet west-northwest and downslope of the site. During initial sampling of surface water features in the vicinity of the site Oxy USA will identify springs and drainages in the immediate vicinity of the #609-14 well pad.\*\*
- Depth to shallow ground water and major aquifers; \*\*It was noted on the COGCC web site that correspondence from COGCC about Form 2A for the Oxy 609-33 well stated that a Cities Service monitoring well (permit # 32-696) is located approximately 2,800 feet north-northwest of the 609-14 location - estimated). That well has a total depth of 340 feet and depth to groundwater of 190 feet – this is believed to be representative of depth to groundwater in the area of the #609-14 location, with some variation in depth to groundwater, depending on topographic differences between the two locations.\*\*
- Water wells within one (1) mile of the site boundary and well depth, depth to water, screened intervals, yields, and aquifer name; \*\*Section 2.5 of the Hydrogeologic Report states that there are no registered water wells within 1 mile (nearest well is approximately 1.5 miles southwest of the site in Section 18, abandoned in 1987).\*\*
- Hydrologic properties of shallow ground water and major aquifers including flow direction, flow rate, and potentiometric surface; \*\*Section 2.4.2 (Upper Piceance Basin Aquifer) discusses the hydrology of the Upper Piceance Basin Aquifer and discusses springs in the study area at approximately 8,200 feet in elevation. The flow direction in the uppermost aquifer is believed to be generally towards the southwest. Also, Section 2.4.1 of the report discusses the Alluvial Aquifer and Section 2.4.3 discusses Deeper Aquifers. Is there more information requested in addition to that provided in these sections? \*\*
- Site location in relation to the floodplain of nearby surface water features; \*\*Section 2.4.4 of the Hydrogeologic Report (Floodplain) discusses the local drainage patterns which indicate that the site is not located in or near a floodplain.\*\*
- Existing quality of shallow ground water; \*\* Section 2.4.5 of the Hydrogeologic Report discusses Aquifer Water Quality as measured in springs, seeps and streams (Walsh, 2009). A

first attempt will be made to sample springs in March, 2011 and quarterly sampling will be conducted for one year following completion of cuttings disposal operations.\*\* and

- An evaluation of the potential for impacts to nearby surface water and ground water. \*\* Sections 3.3 and 3.4 of the Hydrogeologic Report address the Potential Groundwater Pathway and Potential Impacts to (the) Aquifer, respectively.\*\*

Has the site and vicinity been ground truthed for any shallow surface water features and/or expressions (vegetation, etc.)? \*\*Oxy will ground truth the area during the initial baseline water sampling event, when conditions permit access.\*\*

Prepare a summary review of the Drill Cuttings Materials Management Plan. At a minimum, the summary review shall include:

- Summary of spills, incidents or upsets,
- Any changes to the plan, what has worked and what did not work,
- Training requirements for the operator and their contractors ( job hazard analysis, etc.),
- Types of audits conducted of the operators and their contractors (may include GPS tracking of trucks),
- Record keeping to include:
  1. The date of the transport,
  2. The identity of the waste generator,
  3. The identity of the waste transporter,
  4. The location of the waste pickup site,
  5. The type and volume of waste,
  6. The name and location of the treatment or disposal site.

Such records shall be signed by the transporter, made available for inspection by the Director during normal business hours, and copies thereof shall be furnished to the Director upon request. \*\*Oxy will add an accountability assessment to review the adequacy of this plan so that improvements can be made to Oxy's overall waste management program, specifically cuttings management.\*\*

#### Facility Closure:

As indicated in your plan, the facility would be closed the Form 27 process.

Another question that needs to be addressed, is: would the County or the Colorado Department of Public Health and Environment (Solid Waste Division treat this as solid waste site (landfill)? \*\*Disposal of drill cuttings on a COGCC permitted site does not require Garfield County permitting. Disposal of drill cuttings does not require CDPHE (Solid Waste Division) permitting, because no processing or treatment of the cuttings will occur at the site.\*\*

Thanks

Alex

Alex Fischer, P.G.

Environmental Supervisor - Western Colorado

Colorado Oil and Gas Conservation Commission

1120 Lincoln Street, Suite 801

Denver, CO 80203  
(303) 894-2100 ext. 5138  
(303) 894-2109 fax  
[alex.fischer@state.co.us](mailto:alex.fischer@state.co.us)

---

**From:** Fischer, Alex [mailto:Alex.Fischer@state.co.us]  
**Sent:** Thursday, March 17, 2011 1:16 PM  
**To:** Padilla, Daniel  
**Subject:** RE: Cascade Creek 609-14 Drill Cuttings Materials Management Plan

Daniel,

Received your voice mail from last Friday after I had left. I apologize for not getting back to you. Yes we did discuss an approximate QTR mile radius for surface water features and expressions. After further review, I agree that the drainage to the east is on the other side of the ridge. What I am trying to get at, is that the Drill Cutting Materials Management Plan should be such that anyone who reads it (employees, subcontractors, regulatory agencies, general public, etc.) have a clear understanding these factors have been taken into consideration. Each facility is unique and different.

Another question that needs to be addressed, is: would the County or the Colorado Department of Public Health and Environment (Solid Waste Division) treat this as a solid waste site (landfill)?

Thanks  
Alex

Alex Fischer, P.G.  
Environmental Supervisor - Western Colorado  
Colorado Oil and Gas Conservation Commission  
1120 Lincoln Street, Suite 801  
Denver, CO 80203  
(303) 894-2100 ext. 5138  
(303) 894-2109 fax  
[alex.fischer@state.co.us](mailto:alex.fischer@state.co.us)

---

**From:** Daniel\_Padilla@oxy.com [mailto:Daniel\_Padilla@oxy.com]  
**Sent:** Friday, March 11, 2011 6:09 AM  
**To:** Fischer, Alex  
**Subject:** RE: Cascade Creek 609-14 Drill Cuttings Materials Management Plan

Thanks Alex,

I will review and get back to you.

Daniel

---

**From:** Fischer, Alex [mailto:Alex.Fischer@state.co.us]  
**Sent:** Thursday, March 10, 2011 2:49 PM

**To:** Padilla, Daniel  
**Subject:** Cascade Creek 609-14 Drill Cuttings Materials Management Plan

Daniel,

I have outlined comments and some questions regarding the Cascade Creek 609-14 Drill Cuttings Materials Management Plan. I feel that these comments and questions are for all parties to consider the ultimate disposition of the cuttings and potential long term effects in implementing the Cutting's Materials Management Plan.

In the Drill Cuttings Materials Management Plan it is stated that:

- Each well will generate approximately 218 cubic yards of material and then blended with sawdust, there will be an expansion of approximately 330 cubic yards;
- The composite sample will consist of cuttings taken from at least five random locations of the mixed cuttings pile; and
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The COGCC feels that this is not a sufficient number of samples to adequately characterize the materials should be collected. Although the COGCC does not have specific guidance of what is adequate for the number of samples collected and analyzed, we feel that one per 330 cubic yards may not be adequate. That equates to one sample per 66 truck loads using a five-yard dump truck as you indicated.

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Please indicate on map the locations cuttings will originate from and provide the Location ID and legal, QTR/QTR, Section, Township and Range:

- 608-41 = 22 wells;
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- 609-33 = 20 wells; and
- 697-15-01 = 9 wells

Include on this map the 609-14 Annex pad and the Mesa Cutting Disposal Area (MCDA).

Where is the 697-15-01 pad in relation to the 609-14 Annex Pad? This transfer route crosses the Cascade Canyon unnamed drainage.

Has Oxy determined if the 609-14 Annex pad is located in a sensitive area?

Surface Water Monitoring and Features:

The Drill Cutting Management Plan Laboratory Data lists metals that were detected in drill cuttings. Although these are below the 910-1 Table Concentration Levels:

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- While establishing the background water quality, TPH should be included to the proposed list of analytes.
- OXY indicates that quarterly sampling of the stock pond would be performed during disposal operations and continue for four quarters following capping and completion of the disposal operations.

- There appears to be tributary flowing to Conn Creek to the west of the 609-14 Annex and a tributary flowing to Canyon Creek to the east of the 609-14 Annex.

The Walsh Environmental Scientists and Engineers, LLC (Walsh) report addresses some soil and geologic data. Are there:

- Local and regional geologic structures; and
- Any geologic hazards that may affect the design and operation of the facility.

The Walsh report addresses some hydrologic data. What are/is:

- surface water features within two (2) miles;
- Depth to shallow ground water and major aquifers;
- Water wells within one (1) mile of the site boundary and well depth, depth to water, screened intervals, yields, and aquifer name;
- Hydrologic properties of shallow ground water and major aquifers including flow direction, flow rate, and potentiometric surface;
- Site location in relation to the floodplain of nearby surface water features;
- Existing quality of shallow ground water; and
- An evaluation of the potential for impacts to nearby surface water and ground water.

Has the site and vicinity been ground truthed for any shallow surface water features and/or expressions (vegetation, etc.)?

Prepare a summary review of the Drill Cuttings Materials Management Plan. At a minimum, the summary review shall include:

- Summary of spills, incidents or upsets,
- Any changes to the plan, what has worked and what did not work,
- Training requirements for the operator and their contractors ( job hazard analysis, etc.),
- Types of audits conducted of the operators and their contractors (may include GPS tracking of trucks),
- Record keeping to include:
  1. The date of the transport,
  2. The identity of the waste generator,
  3. The identity of the waste transporter,
  4. The location of the waste pickup site,
  5. The type and volume of waste,
  6. The name and location of the treatment or disposal site.

Such records shall be signed by the transporter, made available for inspection by the Director during normal business hours, and copies thereof shall be furnished to the Director upon request.

#### Facility Closure:

As indicated in your plan, the facility would be closed the Form 27 process.

Thanks

Alex

Alex Fischer, P.G.

Environmental Supervisor - Western Colorado

Colorado Oil and Gas Conservation Commission

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**OXY USA WTP LP**  
A subsidiary of Occidental Petroleum Corporation

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Grand Junction, CO 81506

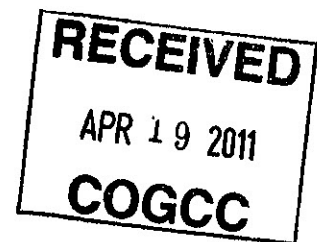


# **OXY USA WTP LP**

## **DRILL CUTTINGS MATERIALS MANAGEMENT PLAN**

**609-14 ANNEX  
STORAGE/STAGING AND DISPOSAL AREA  
FOR DRILL CUTTINGS GENERATED AT  
OXY'S 608-41, 608-43-31,  
609-33, AND 697-15-01 PADS.**

**April 2011**



## **TABLE OF CONTENTS**

<b><u>Section</u></b>	<b><u>Page Number</u></b>
<b>Materials Management Plan (MMP) Overview</b>	<b>2</b>
<b>Drill Cuttings Generation</b>	<b>2</b>
<b>Drill Cuttings Sampling Procedure</b>	<b>3</b>
<b>Cuttings Storage and Disposal</b>	<b>4</b>
<b>Transportation of Cuttings to Disposal and Storage Areas</b>	<b>4</b>
<b>Cuttings Disposal Areas</b>	<b>5</b>
<b>Spill Response and Clean up Procedures</b>	<b>5</b>
<b>Proposed Facility Modifications</b>	<b>6</b>
<b>Facility Closure</b>	<b>6</b>
<b>Surface Water Monitoring</b>	<b>7</b>
<b>Post Cuttings MMP Assessment</b>	<b>7</b>

### **Appendices**

Appendix A – Sample chain-of-custody procedures

### **Attachments:**

Figure 1 Location Map

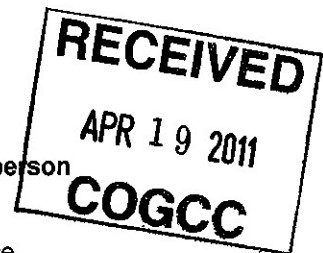
Figure 2 609-14 Annex Pad

Analytical Data

Hydrogeologic Report (Prepared by WALSH)

**Operator contact information**  
OXY USA WTP LP (Operator #66571)  
760 Horizon Drive, Suite 101  
Grand Junction, CO 81506  
(970) 263-3600 – Office  
(970) 263-3694 – Fax

**Designated contact person**  
Daniel Padilla  
Regulatory Advisor  
(970) 263-3637 – Office



## **Materials Management Plan Overview**

OXY USA WTP LP (Oxy) developed this Materials Management Plan (MMP) to address storage management and disposal of drill cuttings at Oxy's Cascade Creek 609-14 Annex pad location where Oxy owns both the surface and minerals (see Figure 1, Location Map). Oxy is requesting review and approval of this plan and supporting documents from the Colorado Oil and Gas Conservation Commission (COGCC) to utilize this location for permanent cuttings disposal. Oxy has included a Hydrogeologic Report prepared by Walsh Environmental Scientists and Engineers, LLC for the 609-14 cuttings disposal area (see Attached report). Oxy's 2011 oil and gas development activities in the Piceance Basin consist of drilling at the 608-41, 608-43-31, 609-33, and 697-15-01 pads located on Oxy owned surface and minerals. Oxy's 2011 drilling plans were initially designed for drilling activities to occur first followed by completions activities. Revisions to the development plan require drilling and completions operations to occur simultaneously at these locations, commonly referred to as SimOps. Pad space normally used to store cuttings for disposal would now be used for SimOps. In order to accommodate SimOps without increasing the pad size, Oxy is proposing to permanently dispose drill cuttings generated from the above-mentioned pads at the 609-14 Annex pad to ensure that all activities are completed safely.

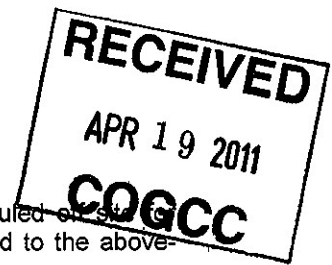
The 609-14 Annex pad is located within Oxy's Cascade Creek operating area, specifically:

- 609-14 Annex pad (Location ID # 336005): SWSW, Section 9, Township 6 South, Range 97 West, Garfield County, Colorado.

## **Drill Cuttings Generation**

Oxy has drilled 17 directional wells from the 608-43-31 pad and 9 wells from the 697-15-01 Annex pad, is currently drilling 22 directional wells from the 608-41 pad and 20 directional wells from the 609-33 pad. Drilling began at the 697-15-01 Annex in October 2010, with SimOps commencing in 2011. At the 608-43-31 pad, drilling began in November 2010 followed by SimOps in 2011. In April 2011, Oxy began drilling at the 609-33 pad which will be followed by SimOps in 2011. Finally, Oxy will begin drilling at the 608-41 pad in March 2011 and SimOps will commence in 2011. Oxy assumes each well drilled will generate approximately 218 cubic yards of drill cuttings. After processing, the cuttings will be blended with sawdust to absorb *de minimus* amounts of liquid. On average, the drill cuttings will expand to approximately 330 cubic yards per well, using a conservative 50 percent swelling factor. Oxy will update the COGCC regarding the approximate volume amount that the close loop system is generating. ✓

Oxy employs a skidable rig capable of drilling up to 24 wells from a single pad. Oxy's drilling rig now utilizes a closed loop system for mud cycling and reuse. The rig air drills the surface hole and then air injected with mud for the production hole. As drill cuttings are returned to the surface they are deposited into a de-gasser. The de-gassing process allows the cuttings and mud to better separate in the next phase. The cuttings and mud are then sent to four rig shakers, which drains out fluids and mud from the cuttings. The cuttings separated in this phase consist of a larger aggregate size and constitute the bulk of the cuttings to be stored off site. In addition to the rig shakers, the cuttings are also sent to four additional drying shakers, which removes another 20 percent of fluids from the cuttings. The separated fluids and mud collected are reused in the drilling process. Finer aggregate cuttings are then separated by sending the cuttings/mud mixture to a settling tank (mud trap), from which the cuttings are then sent to two centrifuges to



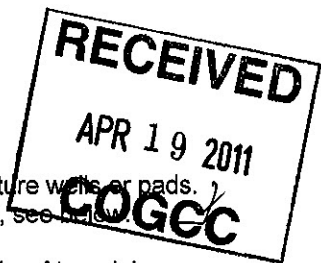
remove low gravity solids (cuttings). These low gravity solids will also be hauled off site for storage and disposal. Any low gravity solids containing cement will be diverted to the above-mentioned pad reserve pit.

To account for additional disposal needs, Oxy is currently preparing permits for additional disposal locations which will follow this format.

### Drill Cuttings Sampling Procedures

In accordance with COGCC regulations for storage and permanent disposal, samples shall be collected throughout the drilling process to document that the cuttings meet the standards which have been established by COGCC. To accomplish this, Oxy will:

- **Background Samples:** Initially, three (3) background samples were collected from undisturbed locations around the 609-14 Annex pad. All background samples were analyzed for COGCC Table 910-1 constituents excluding Hot Water Soluble Boron and Barium will be analyzed via method SW-846.
- **Cuttings Samples:** In an effort to define the concentrations of Table 910-1 constituents which may be encountered on each pad, samples will be collected to determine the geologic source. On each of the first 3 well pads, beginning with the first well drilled, Oxy will collect multiple composite samples from both the surface and production strings, collecting samples of each major formation. Thus, for example, if there are The cuttings samples generated from the first well will be analyzed for the above mentioned analysis. Following the initial well, Oxy will collect cuttings samples from every 4<sup>th</sup> well (the 4<sup>th</sup>, 8<sup>th</sup>, 12<sup>th</sup>, 16<sup>th</sup>, and 20<sup>th</sup>) wells (based on a 22 well pad), targeting composites of surface and production string formations. Oxy will continue to use this numbered well sampling strategy for well pads which have fewer than 22 wells. In general, the samples will be collected in the following manner:
  - Initial well (well 1): Collect three to four composite samples from the surface string; targeting the Uinta, Green River, and Wasatch formations. Then collect six to seven samples from the production string; targeting the Fort Union, Williams Fork (four to five zones), and the Illes formations.
  - Additional wells (wells 4, 8, 12, 16, and 20 for a multi-well pad): Collect one composite sample from the surface string and three composite samples from the production string.
  - These composite samples will be collected from the cuttings storage bin which will consist of cuttings that have been processed and mixed with sawdust, used to absorb *de minimus* amounts of water present in the cuttings, and are ready for storage and disposal.
  - Oxy employs a drilling technique commonly referred to as "batch drilling", where the surface string is drilled for the first 6, 8 or 10 wells, prior to returning to the initial well to drill the production string, where the production string of the 6, 8 or 10 wells will be drilled out. Batch drilling increases Oxy's efficiency by not having to switch out surface and production section tools between each well. Oxy typically batch drills every six wells. Batch drilling will stagger when surface and production string cuttings samples are collected for each well. Oxy will take this staggering into consideration when reviewing and tabulating the analytical data.
- **Analysis of Samples:** The samples collected from the initial well of each pad will be tabulated to characterize cuttings generated from the specific formations and/or combined formations within Oxy's Cascade Creek operating area. Oxy will be looking for any variations or leading indicators in the cuttings to allow Oxy to make recommendations on the sampling frequency of future wells or pads. The samples collected from the additional wells, will also be tabulated characterize cuttings generated from combined formations within in Oxy's Cascade Creek operating area to determine if statistical trends can be identified from the cuttings samples. All samples analyzed will



be used to determine if more or less sampling should be required for future wells or pads. Oxy will report its findings as part of the post cuttings MMP assessment, see below.

Cuttings samples shall be collected directly from the blended cuttings storage bin. At a minimum, three composite samples will be collected from cuttings generated by the drilling of each well. This composite sample will represent concentrations found in the processed cuttings for each well.

The composite sample will consist of cuttings samples taken from at least five random locations on the blended cuttings bin pile and placed in the stainless steel bowl for blending. The blended composite cuttings sample found in the stainless steel bowl will then be packaged in laboratory provided glass jars for sample shipment and analysis. After filling of the appropriate number of jars, sample labels will be prepared and placed over the lid to provide a permanent seal to take the sample through chain-of-custody to the specified laboratory.

The individual collecting the sample should wear a new pair of disposable nitrile gloves for each sample collected to prevent cross-contamination of the samples. The samples should be collected using a stainless steel spoon, trowel or other appropriate equipment. The sampling equipment used will need to be thoroughly cleaned and rinsed with distilled water between each discrete sample. Appropriate sampling containers should be used for each sample. Each discrete sample should be placed into the specified container, and a log generated to identify the date, time, and identification of the person collecting the samples. The containers must be stored in a temperature controlled area which will maintain at or near 40 degrees F. (i.e. a refrigerator).

Each composite sample will be sent to a laboratory for analysis, samples should be given a distinct identification number (for example: 01 cuttings), labeled with the date and time of the sample collection, and the initials of the sampler, placed in a cooler with ice or back into the refrigerator under chain of custody protocol. The samples must be kept on ice and cool, during transportation from the field to the laboratory.

Background samples shall be collected immediately adjacent to the existing pad, in an undisturbed area.

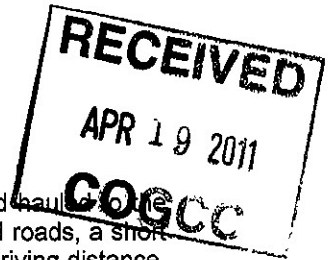
After the lab has analyzed the samples, the lab will provide Oxy with the results in a written report per the specified turn-around time. Oxy will tabulate the results for statistical analysis and trending.

### **Cuttings Storage and Disposal**

Oxy's cuttings storage and disposal plan will consist of:

Transportation of dry cuttings from the above-mentioned pads to the 609-14 Annex pad for permanent disposal:

1. Each cuttings delivery will be offloaded into the 50' by 50' receiving/mixing area located immediately adjacent to the permanent disposal area; the permanent disposal area will be approximately 300' by 100' and surrounded by an earthen berm, see figure 2.
2. After cuttings have been mixed they will be carried over to the permanent disposal area and stacked until approximately 8,700 cubic yards of cuttings are laid there. The cuttings will be set back so that they do not over-run the earthen berm serving as containment for the permanent disposal area.
3. A final 3' cap consisting of native material will be placed on top of the cuttings and seeded.



### **Transportation of Cuttings to Disposal and Storage Areas**

Dry cuttings will be placed onto transport trucks (16 cubic yard dump trucks) and hauled to the 609-14 Annex pad. The transport trucks will travel on Oxy owned and maintained roads, a short distance from each pad. All approximate distances reported below are based on driving distance. The 608-43-31 pad is approximately 4,440' from the 609-14 Annex pad. The 608-41 pad is approximately 6,430 feet from the 609-14 Annex pad. The 697-15-01 Annex pad is approximately 32,880 feet from the 609-14 Annex pad. The 609-33 pad is approximately 8,190 feet from the 609-14 Annex pad. The transport trucks will off-load the dry cuttings at the designated permanent disposal area located on the 609-14 Annex pad. Oxy will track the volume of dry cuttings hauled for disposal at the 609-14 Annex pad.

The transport route from the 697-15-01 pad to the 609-14 Annex pad uses existing access roads and crosses an unnamed drainage to Cascade Canyon as well as the head waters of Cascade Canyon itself. All other transport routes mentioned above do not cross any water ways or drainages. In the event that a transport truck over turns along the transport route, Oxy will implement spill response and clean up procedures, (see below).

Records and logs of cuttings transported from the drilling pad to the disposal area will be provided to Oxy's Regulatory department and shall be kept on file for the life of the disposal location.

### **Cuttings Disposal Areas**

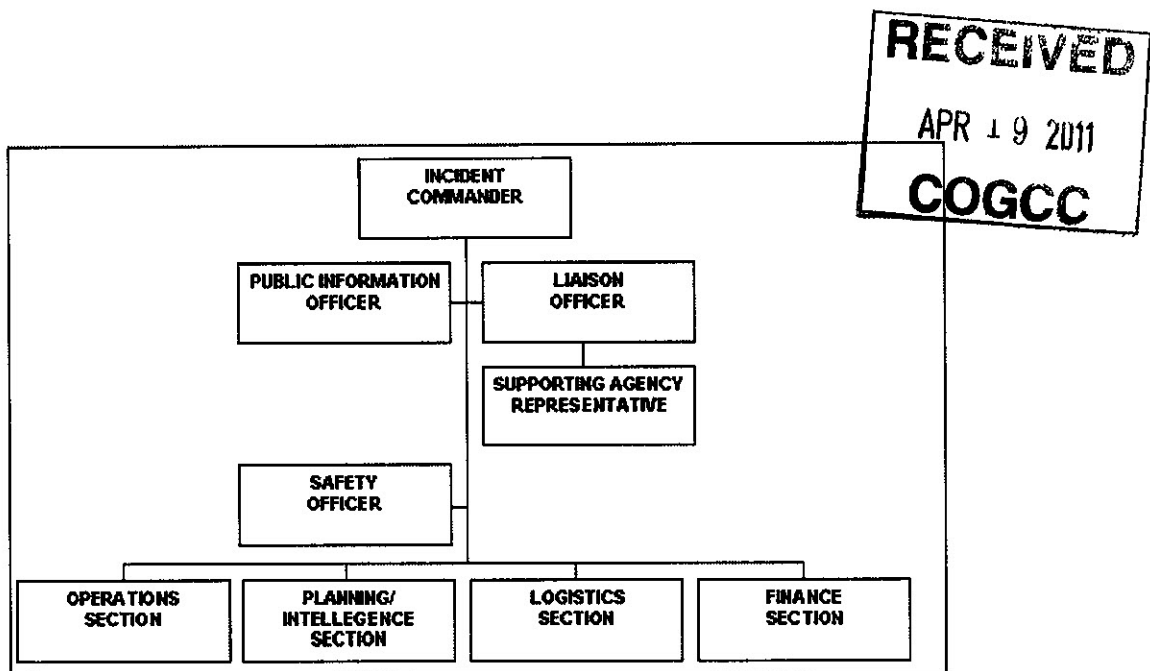
The cuttings disposal areas will be located at the 609-14 Annex pad and will be managed in accordance with COGCC regulations and comply with COGCC Table 910-1 standards. The initial cuttings batch sampled show elevated SAR, pH, and arsenic (see attached analytical results). To address the elevated SAR and pH, the cuttings will be buried and capped with three feet of native soil. Oxy has collected background samples which identify high concentrations of naturally occurring arsenic to be present. Based on these background samples, Oxy believes the elevated concentration of arsenic found in the drill cuttings is originated from natural background present in the soil. Prior to being capped, all cuttings will be blended and a final sample will be collected to ensure compliance with COGCC Table 910-1 standards. The final disposal locations shall be documented and the volume of the cuttings sent to disposal shall be recorded as well.

The dry cuttings would be hauled to the site via transport trucks. The trucks will deliver the cuttings at a designated off loading area where mixing and final disposal will occur.

After the disposal areas have been capped with 3 feet of native fill material; the areas will be prepped for seeding. However, reseeding will generally occur in the early spring or fall which ever comes first to ensure seed germination. The disposal area will be monitored at the next growing season for revegetation efforts.

### **Spill Response and Cleanup Procedures**

In the event that a transport truck overturns and discharges cuttings materials, the site will be secured and Oxy will employ the Incident Command System (ICS):



The ICS is the organization and assignment of key personnel to facilitate the control and removal of an incident which has the potential to harm the public health, safety, and the environment. Oxy emergency response personnel following the ICS will ensure that the area is safe and that no fuel or hydraulic fluid has been released. If fuel, hydraulic fluid or other refined chemical has released, then the release will be contained, cleaned up, and if applicable reported to the necessary agencies. Please refer to the Oxy's Emergency Response Plan to identify individual roles and responsibilities associated with the ICS.

Any processed cuttings that have discharged from the truck will be contained, collected, and taken to the disposal area. The cuttings shall be transported in a dry state and therefore will not run-off or generate an impact beyond the release area.

Following control and removal of the incident, Oxy will ensure that any and all required governmental and non-governmental agencies will be contacted. Please refer to Table 1 of the Emergency Response Plan for Agency emergency contact information.

#### **Proposed Facility Modifications**

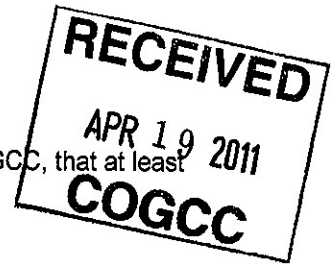
Oxy will notify the COGCC in writing if proposed modifications to the facility design, operating plan, permit data, or permit conditions change following applicable COGCC rules.

#### **Facility Closure**

Oxy will comply with established COGCC rules by submitting a detailed Site Investigation and Remediation Workplan, Form 27, prior to facility closure to the Director for approval. Outlined below are operations and activities which Oxy assumes could be associated with the preliminary closure of the 609-14 Annex cuttings management plan location:

- Stacking of the processed cuttings;
- Capping the cuttings with at least 3 feet of native fill material;
- Composite sample collection of disposal area to ensure adequate capping of the cuttings;
- Final contour and seed bed preparation, followed by seeding during the appropriate season;
- Monitor seeding efforts and stormwater best management practices on the cuttings disposal area.

It is assumed that after the initial Form 27 is submitted and approved by the COGCC, that at least one more Form 27 will be submitted for final closure of the location.



### **Surface Water Monitoring**

Water quality sampling will be conducted at the stock pond located approximately 3,000 feet south of the proposed cuttings disposal location (see Figure 1). Oxy will also conduct an on-the-ground assessment looking for additional surface water sources, such as springs. If any are found they will also be sampled and a GPS point will be collected for all sampling locations. Oxy will collect one sample from the stock pond and additional locations (if any) prior to commencing disposal operations at the proposed location to serve as a background assessment of water quality parameters in the area. All sampling events will be contingent upon suitable environmental conditions; should inclement weather, including severe storms or accumulated snow prevent access to the sampling locations, Oxy will reschedule the sampling event at the next available opportunity. Quarterly water samples will be collected during disposal operations and will continue for an additional four quarters following the capping and completion of the disposal operations. Whenever achievable, quarterly samples during operation and post-operations will be conducted during peak flow and/or considerable seasonal flow. Whenever this is not achievable, Oxy will continue to conduct quarterly sampling during normal season weather events to ensure adequate water quality data is analyzed. Background, quarterly during operation, and quarterly post-operation samples will be collected as grab samples from the same location on the up-gradient side of the stock pond to ensure reproducible data is collected and analyzed. All water samples will be collected and analyzed for COGCC Table 910-1 water standards to include; Total Petroleum Hydrocarbons (TPH), benzene, toluene, ethylbenzene, and total xylenes (BTEX), dissolved metals, total dissolved solids, chlorides, and sulfates.

The individual collecting the sample will wear a new pair of disposable nitrile gloves for each sample collected to prevent cross-contamination of the samples. The individual collecting the surface water sample will fill, cap, and seal all laboratory provided containers using laboratory provided labels. The individual collecting the samples will follow all storage, shipment, and chain-of-custody procedures implemented by Oxy and outlined in this MMP.

### **Post Cuttings MMP Assessment**

Following the closure of the location, Oxy will complete an assessment of the cuttings MMP. Oxy's assessment will determine the effectiveness of this plan to adequately meet the COGCC's waste management requirements. Oxy will prepare a summary review to include:

- Summary of spills, incidents or upsets, if any,
- Any changes to the plan, that identify what has worked and what did not work,
- Training requirements for Oxy personnel and their contractors (job hazard analysis, etc.),
- Types of audits conducted of the Oxy's personnel and drilling contractors,
- Record keeping such as hauling tickets that include:
  - Location that the cuttings originated from
  - Location of where the cuttings were disposed of,
  - Date of transport,
  - Volume of cuttings transported, and
  - Name of the transport company.
- Cutting samples, both tabulated data as well as the Laboratory data.
- Surface water samples, both tabulated data as well as the Laboratory data.
- Status of reclamation efforts.
- Recommendations for future cuttings MMP plans.

Oxy will provide the COGCC with a copy of the assessment on the final Form 27 site closure plan.



# Drill Cutting Management Plan Laboratory Data

		Sample Identifications (mg/kg)							
		697-09-50B 9/25/10	697-08-56A 10/14/10	609-33 (1) 1/15/11	609-33 (2) 1/15/11	609-33 (3) 1/15/11	608-43-31 (1) 1/15/11	608-43-31 (2) 1/15/11	608-43-31 (3) 1/15/11
MCL (mg/kg)									
Organics in Soil									
TPH (GRO and DRO)	500			18.0	16.3	26.8	294.6	293.8	232.0
Benzene	0.17			0.0054	0.0060	0.0087	0.025	0.029	0.022
Toluene	85			0.03	0.0320	0.04	0.09	0.10	0.074
Ethylbenzene	100			0.01	0.0140	0.02	0.03	0.03	0.0180
Xylenes	175			0.09	0.0960	0.13	0.16	0.17	0.12
Organics in Soil (PAH's)									
Acenaphthene	1000			BDL	BDL	BDL	BDL	BDL	BDL
Anthracene	1000			BDL	BDL	BDL	BDL	BDL	BDL
Benzo(A)anthracene	0.22			BDL	BDL	BDL	BDL	BDL	BDL
Benzo(B)fluoranthene	0.22			BDL	BDL	BDL	BDL	BDL	BDL
Benzo(K)fluoranthene	2.2			BDL	BDL	BDL	BDL	BDL	BDL
Benzo(A)pyrene	0.022			BDL	BDL	BDL	BDL	BDL	BDL
Chrysene	22			BDL	BDL	BDL	BDL	BDL	BDL
Dibenzo(A,H)anthracene	0.022			BDL	BDL	BDL	BDL	BDL	BDL
Fluoranthene	1000			BDL	BDL	BDL	BDL	BDL	BDL
Flourene	1000			BDL	BDL	BDL	BDL	BDL	BDL
Indeno(1,2,3,C,D)pyrene	0.22			BDL	BDL	BDL	BDL	BDL	BDL
Napthalene	23			0.092	0.086	0.067	0.047	0.059	0.06
Pyrene	1000			BDL	BDL	BDL	BDL	BDL	BDL
Inorganics in Soil									
EC	<4 mmhos/cm or 2X background			1.0	1.1	1.0	1.9	1.9	1.9
SAR	<12	44.0	47.0	31.0	57.0	31.0	52.0	27.0	55.0
pH	6-9	7.9	9.2	9.3	9.4	9.4	9.1	9.2	9.2
Metals in Soils									
Arsenic	0.39	2.4	2.4	3.5	3.4	3.8	9.9	10.0	8.6
Barium	15000			220.0	200.0	220	260	260	250
Cadmium	70			BDL	BDL	BDL	BDL	BDL	BDL
Chromium	12000			11.0	9.2	10.0	16.1	18.4	17.5
Chromium VI	23			1.1	1.2	1.4	1.1	1.4	1.5
Copper	3100			7.9	7.5	9.2	16.0	16.0	16.0
Lead	400			8.2	8.9	10.0	14.0	14.0	14.0
Mercury	23			0.01	0.01	0.013	0.010	0.010	0.010
Nickel	1600			5.9	6.6	7.9	11.0	11.0	13.0
Selenium	390			BDL	BDL	BDL	BDL	BDL	BDL
Silver	390			BDL	BDL	BDL	BDL	BDL	BDL
Zinc	23000			21.0	21.0	25.0	33.0	38.0	32.0



608-41  
Location ID 324100  
NENE, Sec 8, T6S, R97W, 6th PM

608-43-31  
Location ID 383337  
NESE, Sec 8, T6S, R97W, 6th PM

Mesa Cuttings Disposal Area  
NWSE, Sec 9, T6S, R97W, 6th PM

609-33  
Location ID 335801  
NWSE, Sec 9, T6S, R97W, 6th PM

609-14 Annex  
Location ID 336005  
SWSW, Sec 9, T6S, R97W, 6th PM

697-15-01 Annex  
Location ID 335921  
NWNW, Sec 15, T6S, R97W, 6th PM

RECEIVED  
APR 19 2011  
GJGCC

■ Drill Cuttings Generated Location  
■ Drill Cuttings Disposal Location  
■ Additional Disposal Location



# 609-14 Pad & Vicinity

Receiving / Mixing Area

CC 609-14  
WELLHEAD

INSTALL  
POTABLE  
WATER  
CONTAINER

IN  
SE

INSTALL  
GENERA  
INSTALL  
FUEL TANK

INSTALL  
BEAR PROOF  
TRASH  
CONTAINER

EXISTING AF

Cutting Reclamation Site

RIG MANAGER

CAPTAINS SKID

SLEEPER SKID

20'

20'

20'

POTABLE  
WATER  
SEPTIC SKID

POTABLE  
WATER  
SEPTIC SKID

FLOWBACK  
SKID

CONSTRUCT  
BLOOE PIT

AS CONSTRUCTED  
CC 609-14 PAD  
EXPANSION  
ELEV. 8396.4

Material source  
(Pad interim reclaim)

EDGE OF  
DISTURBANCE

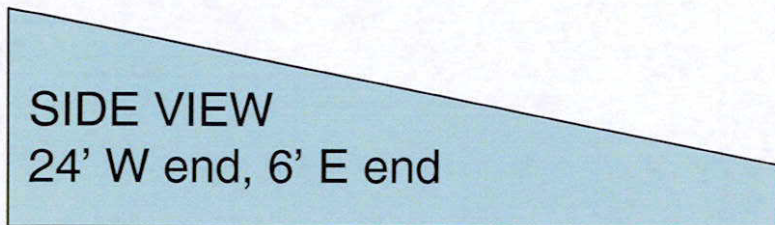
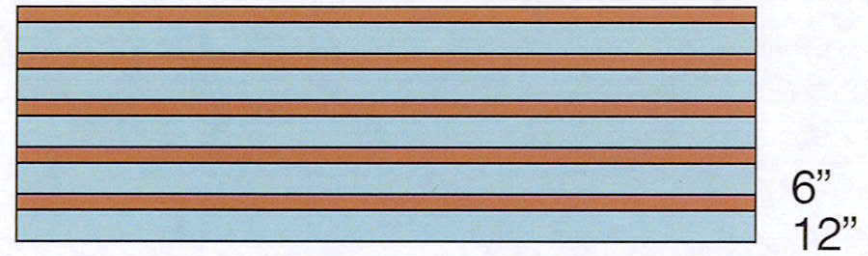
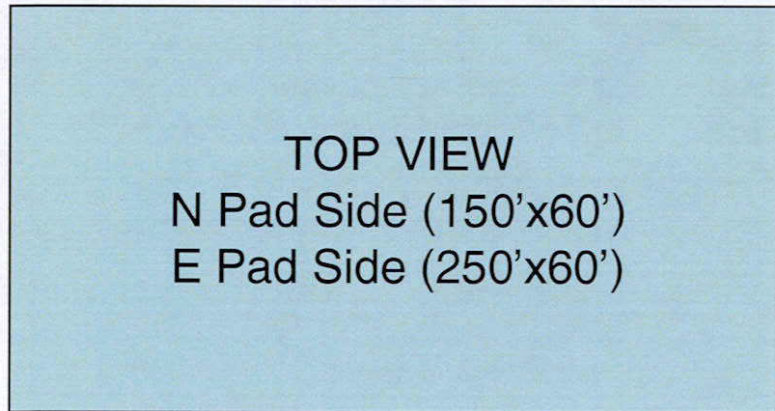
PROPOSED DRILL CAMP AND PAD



FEB 02 2011

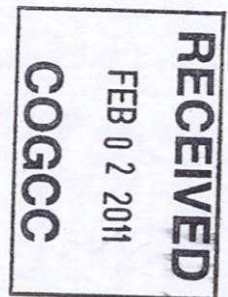


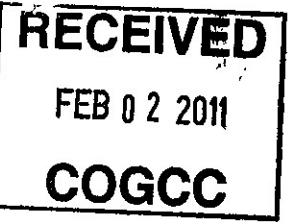
## CUTTING RECLAIM AREA (Pad)



Concept: Cuttings will be reclaimed on area utilizing layered mixing and reclamation in order to stack multiple layers. Once height reaches over 6' it will require use of excavator to lift cuttings onto site. Final layer will be capped with 3' cover and seeded.

$V(\text{Pad}) = 6 * (250 * 60 + 150 * 60) + 18 * (150 * 60 + 150 * 60) / 2 = 360000 \text{ cf} = 13,000 \text{ cy}$   
2:1 of cuttings mixed (12" lift), 100% virgin stabilizer (6" lift)  
V=8700cy cuttings capacity





## Appendix A – Chain-of-custody Procedures

Written procedures for sample handling should be available and followed whenever samples are collected, transferred, stored, analyzed or destroyed. For the purposes of litigation (and quality control), it is necessary to have an accurate written record to trace the possession and handling of samples from collection through reporting. The procedures defined here represent a means to satisfy this requirement.

### A. Sample is in someone's "custody" if:

1. It is in one's actual physical possession;
2. It is in one's view, after being in one's physical possession;
3. It is one's physical possession and then locked up so that no one can tamper with it;
4. It is kept in a secured area, restricted to authorized personnel only.

### B. Sample Collection, Handling and Identification

1. It is important that a minimum number of persons be involved in sample collection and handling. Field records should be completed at the time the sample is collected and should be signed or initialed, including the date and time, by the sample collector(s). Field records should contain the following information:
  - a. Unique sample or log number;
  - b. Date and time;
  - c. Source of sample (including name, location and sample type);
  - d. Name of collector(s);
  - e. Comments.
2. Each sample is identified by affixing a pressure sensitive gummed label or standardized tag on the container(s). This label should contain the sample number, source of sample, preservative used, and the collector(s)' initials. The analysis required should be identified. Where a label is not available, the sample information should be written on the sample container with an indelible marking pen.
3. The closed sample container should then be placed in a transportation case or appropriate container along with the chain-of-custody record form, pertinent field records, and analysis request forms (these forms will be supplied with the appropriate sample containers). A transportation case if used should then be sealed and labeled. All records should be filled out legibly in waterproof pen. The use of locked or sealed chests will eliminate the need for close control of individual sample containers. However, there will undoubtedly be occasions when the use of a chest will be inconvenient. On these occasions, the sampler should place a seal around the cap of the individual sample container which would indicate tampering if removed.

### C. Transfer of Custody and Shipment

1. When transferring the possession of the samples, the transferee must sign and record the date and time on the chain-of-custody record. Custody transfers, if made to a sample custodian in the field, should account for each individual sample, although samples may be transferred as a group. Every person who takes custody must fill in the appropriate section of the chain-of-custody record.
2. The field custodian (or field sampler if a custodian has not been assigned) is responsible for properly packaging and dispatching samples to the appropriate laboratory for analysis. This responsibility includes filling out, dating, and signing the appropriate portion of the chain-of-custody record.
3. All packages sent to the laboratory should be accompanied by the chain-of-custody record and other pertinent forms. A copy of these forms should be retained by the field custodian (either carbon or photocopy).

4. Mailed packages can be registered with return receipt requested. If packages are sent by common carrier, receipts should be retained as part of the permanent chain-of-custody documentation.
5. Samples to be transported must be packed to prevent breakage. If samples are shipped by mail or by other common carrier, the shipper must comply with any applicable Department of Transportation regulations. (Most water samples are exempt unless quantities of preservatives used are greater than certain levels.) The package must be sealed or locked to prevent tampering. Any evidence of tampering should be readily detected if adequate sealing devices are used.

If the field sampler delivers samples to the laboratory, custody may be relinquished to laboratory personnel. If appropriate personnel are not present to receive the samples, they should be locked in a designated area of the laboratory to prevent tampering. The person delivering the samples should make a log entry stating where and how the samples were delivered and secured. Laboratory personnel may then receive custody by noting in a logbook, the absence of evidence of tampering, unlocking the secured area, and signing the custody sheet.



FEB 02 2011

COGCC

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Mt. Juliet, TN 37122  
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1-800-767-5859  
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Est. 1970

Paul Townsend  
OXY USA Inc - Grand Junction, CO  
760 Horizon Dr., Ste. 101  
Grand Junction, CO 81506

### Report Summary

Monday October 04, 2010

Report Number: L481092

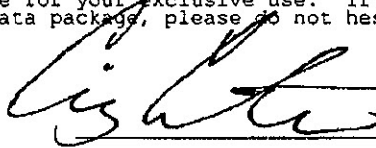
Samples Received: 09/28/10

Client Project:

Description: 697-09-50B

The analytical results in this report are based upon information supplied by you, the client, and are for your exclusive use. If you have any questions regarding this data package, please do not hesitate to call.

Entire Report Reviewed By:

  
Craig Cothron, ESC Representative

### Laboratory Certification Numbers

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT - PH-0197, FL - E87487  
GA - 923, IN - C-TN-01, KY - 90010, KYUST - 0016, NC - ENV375/DW21704, ND - R-140  
NJ - TN002, NJ NELAP - TN002, SC - 84004, TN - 2006, VA - 00109, WV - 233  
AZ - 0612, MN - 047-999-395, NY - 11742, WI - 998093910, NV - TN000032008A,  
TX - T104704245, OK-9915

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REPORT OF ANALYSIS

October 04, 2010

Paul Townsend  
OXY USA Inc - Grand Junction, CO  
760 Horizon Dr., Ste. 101  
Grand Junction, CO 81506

Date Received : September 28, 2010  
Description : 697-09-50B  
Sample ID : 50B CUTTINGS  
Collected By : Sam Autrey  
Collection Date : 09/25/10 15:00

ESC Sample # : L481092-01

Site ID :

Project # :

Parameter	Result	MDL	RDL	Units	Qualifier	Method	Date	Dil.
pH	7.9			su		9045D	09/30/10	1
Sodium Adsorption Ratio	44.					Calc.	10/02/10	1
Arsenic	2.4	0.32	1.0	mg/kg		6010B	10/01/10	1

U = ND (Not Detected)

MDL = Minimum Detection Limit = LOD

RDL = Reported Detection Limit = LOQ = PQL = EQL

Note:

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Reported: 10/04/10 11:56 Printed: 10/04/10 11:56  
L481092-01 (PH) - 7.9820.0c



Summary of Remarks For Samples Printed  
10/04/10 at 11:56:37

TSR Signing Reports: 134  
R5 - Desired TAT

Sample: L481092-01 Account: OXYGJCO Received: 09/28/10 09:00 Due Date: 10/05/10 00:00 RPT Date: 10/04/10 11:56



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Brett Kennedy  
OXY USA Inc - Grand Junction, CO  
760 Horizon Dr., Ste. 101  
Grand Junction, CO 81506

### Report Summary

Sunday October 24, 2010

Report Number: L483971

Samples Received: 10/14/10

Client Project:

Description: 697-08-56A

The analytical results in this report are based upon information supplied by you, the client, and are for your exclusive use. If you have any questions regarding this data package, please do not hesitate to call.

Entire Report Reviewed By:

Mark W. Beasley, ESC Representative

### Laboratory Certification Numbers

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT - PH-0197, FL - E87487  
GA - 923, IN - C-TN-01, KY - 90010, KYUST - 0016, NC - ENV375/DW21704, ND - R-140  
NJ - TN002, NJ NELAP - TN002, SC - 84004, TN - 2006, VA - 00109, WV - 233  
AZ - 0612, MN - 047-999-395, NY - 11742, WI - 998093910, NV - TN000032008A,  
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REPORT OF ANALYSIS

Brett Kennedy  
OXY USA Inc - Grand Junction, CO  
760 Horizon Dr., Ste. 101  
Grand Junction, CO 81506

October 24, 2010

Date Received : October 14, 2010  
Description : 697-08-56A

Sample ID : CUTTINGS

Collected By : Thomas Etheridge  
Collection Date : 10/12/10 07:45

ESC Sample # : L483971-01

Site ID :

Project # :

Parameter	Result	MDL	RDL	Units	Qualifier	Method	Date	Dil.
pH	9.2			su		9045D	10/18/10	1
Sodium Adsorption Ratio	47.					Calc.	10/20/10	1
Arsenic	2.4	0.32	1.0	mg/kg		6010B	10/22/10	1

U = ND (Not Detected)

MDL = Minimum Detection Limit = LOD

RDL = Reported Detection Limit = LOQ = PQL = EQL

Note:

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Reported: 10/24/10 12:00 Printed: 10/24/10 12:01  
L483971-01 (PH) - 9.2@19.3C

Summary of Remarks For Samples Printed  
10/24/10 at 12:01:18

TSR Signing Reports: 134  
R5 - Desired TAT

Sample: L483971-01 Account: OXYGJCQ Received: 10/14/10 09:00 Due Date: 10/21/10 00:00 RPT Date: 10/24/10 12:00



YOUR LAB OF CHOICE

OXY USA Inc - Grand Junction, CO  
Brett Kennedy  
760 Horizon Dr., Ste. 101

Grand Junction, CO 81506

Quality Assurance Report  
Level II

L483971

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October 24, 2010

Analyte	Result	Laboratory Blank		Limit	Batch	Date Analyzed		
		Units	% Rec					
pH	5.30	su			WG503958	10/18/10 22:55		
Arsenic	< 1	mg/kg			WG503952	10/22/10 17:06		
Analyte	Units	Result	Duplicate Duplicate	RPD	Limit	Ref Samp	Batch	
pH	su	8.00	7.90	1.26*	1	L483750-76	WG503958	
pH	su	7.80	7.80	0	1	L484041-03	WG503958	
Arsenic	mg/kg	3.50	3.20	8.38	20	L483996-05	WG503952	
Analyte	Units	Laboratory Control Sample		% Rec	Limit	Batch		
		Known Val	Result					
pH	su	6.92	6.90	99.7	97.98-102.02	WG503958		
Arsenic	mg/kg	192	172.	89.6	78.6-120.8	WG503952		
Analyte	Units	Laboratory Control Sample Duplicate	% Rec	Limit	RPD	Limit	Batch	
		Result Ref	%Rec					
pH	su	6.90 6.90	100.	97.98-102.02	0	20	WG503958	
Analyte	Units	MS Res	Matrix Spike Ref Res	TV	% Rec	Limit	Ref Samp	Batch
Arsenic	mg/kg	48.0	3.20	50	89.6	75-125	L483996-05	WG503952
Analyte	Units	MSD	Matrix Spike Ref	Duplicate %Rec	Limit	RPD	Limit Ref Samp	Batch
Arsenic	mg/kg	51.4	48.0	96.4	75-125	6.84	20 L483996-05	WG503952

Batch number /Run number / Sample number cross reference

WG503958: R1433770: L483971-01  
WG503737: R1436909: L483971-01  
WG503952: R1440971: L483971-01

\* \* Calculations are performed prior to rounding of reported values .  
\* Performance of this Analyte is outside of established criteria.  
For additional information, please see Attachment A 'List of Analytes with QC Qualifiers.'



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October 24, 2010

The data package includes a summary of the analytic results of the quality control samples required by the SW-846 or CMA methods. The quality control samples include a method blank, a laboratory control sample, and the matrix spike/matrix spike duplicate analysis. If a target parameter is outside the method limits, every sample that is effected is flagged with the appropriate qualifier in Appendix B of the analytic report.

Method Blank - an aliquot of reagent water carried through the entire analytic process. The method blank results indicate if any possible contamination exposure during the sample handling, digestion or extraction process, and analysis. Concentrations of target analytes above the reporting limit in the method blank are qualified with the "B" qualifier.

Laboratory Control Sample - is a sample of known concentration that is carried through the digestion/extraction and analysis process. The percent recovery, expressed as a percentage of the theoretical concentration, has statistical control limits indicating that the analytic process is "in control". If a target analyte is outside the control limits for the laboratory control sample or any other control sample, the parameter is flagged with a "J4" qualifier for all effected samples.

Matrix Spike and Matrix Spike Duplicate - is two aliquots of an environmental sample that is spiked with known concentrations of target analytes. The percent recovery of the target analytes also has statistical control limits. If any recoveries that are outside the method control limits, the sample that was selected for matrix spike/matrix spike duplicate analysis is flagged with either a "J5" or a "J6". The relative percent difference (%RPD) between the matrix spike and the matrix spike duplicate recoveries is all calculated. If the RPD is above the method limit, the effected samples are flagged with a "J3" qualifier.



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Alonzo Herandez  
OXY USA Inc - Grand Junction, CO  
760 Horizon Dr., Ste. 101  
Grand Junction, CO 81506

### Report Summary

Thursday January 20, 2011

Report Number: L497659

Samples Received: 01/18/11

Client Project:

Description: 609-33/608-43-31/697-16A2

The analytical results in this report are based upon information supplied by you, the client, and are for your exclusive use. If you have any questions regarding this data package, please do not hesitate to call.

Entire Report Reviewed By:

Mark W. Beasley, ESC Representative

### Laboratory Certification Numbers

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT - PH-0197, FL - E87487  
GA - 923, IN - C-TN-01, KY - 90010, KYUST - 0016, NC - ENV375/DW21704, ND - R-140  
NJ - TN002, NJ NELAP - TN002, SC - 84004, TN - 2006, VA - 00109, WV - 233  
AZ - 0612, MN - 047-999-395, NY - 11742, WI - 998093910, NV - TN000032008A,  
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# REPORT OF ANALYSIS

Alonzo Hernandez  
OXY USA Inc - Grand Junction, CO  
760 Horizon Dr., Ste. 101  
Grand Junction, CO 81506

January 20, 2011

Date Received : January 18, 2011  
Description : 609-33/608-43-31/697-16A2  
Sample ID : 609-33 1  
Collected By : Jerry David  
Collection Date : 01/15/11 19:00

ESC Sample # : L497659-01

Site ID :

Project # :

Parameter	Result	MDL	RDL	Units	Qualifier	Method	Date	Dil.
Chromium, Hexavalent	1.1	0.31	2.0	mg/kg	J	3060A/7	01/18/11	1
Chromium, Trivalent	9.5	0.17	0.50	mg/kg		Calc.	01/19/11	1
ORP	5.0			mV		2580	01/18/11	1
pH	9.3			su		9045D	01/19/11	1
Sodium Adsorption Ratio	31.					Calc.	01/19/11	1
Specific Conductance	1000			umhos/cm		9050AMo	01/19/11	1
Mercury	0.013	0.0015	0.020	mg/kg	J	7471	01/19/11	1
Arsenic	3.5	0.32	1.0	mg/kg		6010B	01/19/11	1
Barium	220	0.050	0.25	mg/kg		6010B	01/19/11	1
Cadmium	U	0.040	0.25	mg/kg		6010B	01/19/11	1
Chromium	11.	0.085	0.50	mg/kg		6010B	01/19/11	1
Copper	7.9	0.21	1.0	mg/kg		6010B	01/19/11	1
Lead	8.2	0.090	0.25	mg/kg		6010B	01/19/11	1
Nickel	5.9	0.26	1.0	mg/kg		6010B	01/19/11	1
Selenium	U	0.32	1.0	mg/kg		6010B	01/19/11	1
Silver	U	0.16	0.50	mg/kg		6010B	01/19/11	1
Zinc	21.	0.34	1.5	mg/kg		6010B	01/19/11	1
Benzene	0.0054	0.00090	0.0025	mg/kg		8021/80	01/18/11	5
Toluene	0.029	0.0015	0.025	mg/kg		8021/80	01/18/11	5
Ethylbenzene	0.013	0.0013	0.0025	mg/kg	B	8021/80	01/18/11	5
Total Xylene	0.088	0.0028	0.0075	mg/kg		8021/80	01/18/11	5
TPH (GC/FID) Low Fraction	1.0	0.14	0.50	mg/kg		GRO	01/18/11	5
Surrogate Recovery-%								
a,a,a-Trifluorotoluene (FID)	102.			% Rec.		8021/80	01/18/11	5
a,a,a-Trifluorotoluene (PID)	99.5			% Rec.		8021/80	01/18/11	5
TPH (GC/FID) High Fraction	17.	0.77	4.0	mg/kg		3546/DR	01/19/11	1
Surrogate recovery(%)								
o-Terphenyl	89.9			% Rec.		3546/DR	01/19/11	1
Polynuclear Aromatic Hydrocarbons								
Anthracene	U	0.0082	0.033	mg/kg		8270C	01/19/11	1
Acenaphthene	U	0.0082	0.033	mg/kg		8270C	01/19/11	1
Acenaphthylene	U	0.0078	0.033	mg/kg		8270C	01/19/11	1
Benzo(a)anthracene	U	0.0077	0.033	mg/kg		8270C	01/19/11	1

U = ND (Not Detected)

MDL = Minimum Detection Limit = LOD

RDL = Reported Detection Limit = LOQ = PQL = EQL

Note:

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L497659-01 (PH) - 9.3@20.0c





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REPORT OF ANALYSIS

Alonzo Hernandez  
OXY USA Inc - Grand Junction, CO  
760 Horizon Dr., Ste. 101  
Grand Junction, CO 81506

January 20, 2011

Date Received : January 18, 2011  
Description : 609-33/608-43-31/697-16A2  
  
Sample ID : 609-33 1  
  
Collected By : Jerry David  
Collection Date : 01/15/11 19:00

ESC Sample # : L497659-01

Site ID :

Project # :

Parameter	Result	MDL	RDL	Units	Qualifier	Method	Date	Dil.
Benzo(a)pyrene	U	0.0073	0.033	mg/kg		8270C	01/19/11	1
Benzo(b)fluoranthene	U	0.0086	0.033	mg/kg		8270C	01/19/11	1
Benzo(g,h,i)perylene	U	0.0050	0.033	mg/kg		8270C	01/19/11	1
Benzo(k)fluoranthene	U	0.0074	0.033	mg/kg		8270C	01/19/11	1
Chrysene	U	0.0067	0.033	mg/kg		8270C	01/19/11	1
Dibenz(a,h)anthracene	U	0.0058	0.033	mg/kg		8270C	01/19/11	1
Fluoranthene	U	0.0069	0.033	mg/kg		8270C	01/19/11	1
Fluorene	U	0.0059	0.033	mg/kg		8270C	01/19/11	1
Indeno(1,2,3-cd)pyrene	U	0.0059	0.033	mg/kg		8270C	01/19/11	1
Naphthalene	0.092	0.0074	0.033	mg/kg		8270C	01/19/11	1
Phenanthrene	0.018	0.0067	0.033	mg/kg	J	8270C	01/19/11	1
Pyrene	U	0.0077	0.033	mg/kg		8270C	01/19/11	1
Surrogate Recovery								
Nitrobenzene-d5	80.5			% Rec.		8270C	01/19/11	1
2-Fluorobiphenyl	75.5			% Rec.		8270C	01/19/11	1
p-Terphenyl-d14	50.3			% Rec.		8270C	01/19/11	1

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L497659-01 (PH) - 9.3@20.0c



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# REPORT OF ANALYSIS

Alonzo Hernandez  
OXY USA Inc - Grand Junction, CO  
760 Horizon Dr., Ste. 101  
Grand Junction, CO 81506

January 20, 2011

Date Received : January 18, 2011  
Description : 609-33/608-43-31/697-16A2  
Sample ID : 609-33 2  
Collected By : Jerry David  
Collection Date : 01/15/11 19:00

ESC Sample # : L497659-02

Site ID :

Project # :

Parameter	Result	MDL	RDL	Units	Qualifier	Method	Date	Dil.
Chromium, Hexavalent	1.2	0.31	2.0	mg/kg	J	3060A/7	01/18/11	1
Chromium, Trivalent	8.0	0.17	0.50	mg/kg		Calc.	01/19/11	1
ORP	0.0			mV		2580	01/18/11	1
pH	9.4			su		9045D	01/19/11	1
Sodium Adsorption Ratio	57.					Calc.	01/19/11	1
Specific Conductance	1100			umhos/cm		9050AMo	01/19/11	1
Mercury	0.011	0.0015	0.020	mg/kg	J	7471	01/19/11	1
Arsenic	3.4	0.32	1.0	mg/kg		6010B	01/19/11	1
Barium	200	0.050	0.25	mg/kg		6010B	01/19/11	1
Cadmium	U	0.040	0.25	mg/kg		6010B	01/19/11	1
Chromium	9.2	0.085	0.50	mg/kg		6010B	01/19/11	1
Copper	7.5	0.21	1.0	mg/kg		6010B	01/19/11	1
Lead	8.9	0.090	0.25	mg/kg		6010B	01/19/11	1
Nickel	6.6	0.26	1.0	mg/kg		6010B	01/19/11	1
Selenium	U	0.32	1.0	mg/kg		6010B	01/19/11	1
Silver	U	0.16	0.50	mg/kg		6010B	01/19/11	1
Zinc	21.	0.34	1.5	mg/kg		6010B	01/19/11	1
Benzene	0.0060	0.00090	0.0025	mg/kg		8021/80	01/18/11	5
Toluene	0.032	0.0015	0.025	mg/kg		8021/80	01/18/11	5
Ethylbenzene	0.014	0.0013	0.0025	mg/kg	B	8021/80	01/18/11	5
Total Xylene	0.096	0.0028	0.0075	mg/kg		8021/80	01/18/11	5
TPH (GC/FID) Low Fraction	1.3	0.14	0.50	mg/kg		GRO	01/18/11	5
Surrogate Recovery-%								
a,a,a-Trifluorotoluene(FID)	103.			% Rec.		8021/80	01/18/11	5
a,a,a-Trifluorotoluene(PID)	98.6			% Rec.		8021/80	01/18/11	5
TPH (GC/FID) High Fraction	15.	0.77	4.0	mg/kg		3546/DR	01/19/11	1
Surrogate recovery(%)								
o-Terphenyl	90.4			% Rec.		3546/DR	01/19/11	1
Polynuclear Aromatic Hydrocarbons								
Anthracene	U	0.0082	0.033	mg/kg		8270C	01/19/11	1
Acenaphthene	U	0.0082	0.033	mg/kg		8270C	01/19/11	1
Acenaphthylene	U	0.0078	0.033	mg/kg		8270C	01/19/11	1
Benzo(a)anthracene	U	0.0077	0.033	mg/kg		8270C	01/19/11	1

U = ND (Not Detected)

MDL = Minimum Detection Limit = LOD

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Note:

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L497659-02 (PH) - 9.4@20.7c



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# REPORT OF ANALYSIS

Alonzo Hernandez  
OXY USA Inc - Grand Junction, CO  
760 Horizon Dr., Ste. 101  
Grand Junction, CO 81506

January 20, 2011

Date Received : January 18, 2011  
Description : 609-33/608-43-31/697-16A2  
Sample ID : 609-33 2  
Collected By : Jerry David  
Collection Date : 01/15/11 19:00

ESC Sample # : L497659-02

Site ID :

Project # :

Parameter	Result	MDL	RDL	Units	Qualifier	Method	Date	Dil.
Benzo(a)pyrene	U	0.0073	0.033	mg/kg		8270C	01/19/11	1
Benzo(b)fluoranthene	U	0.0086	0.033	mg/kg		8270C	01/19/11	1
Benzo(g,h,i)perylene	U	0.0050	0.033	mg/kg		8270C	01/19/11	1
Benzo(k)fluoranthene	U	0.0074	0.033	mg/kg		8270C	01/19/11	1
Chrysene	U	0.0067	0.033	mg/kg		8270C	01/19/11	1
Dibenz(a,h)anthracene	U	0.0058	0.033	mg/kg		8270C	01/19/11	1
Fluoranthene	U	0.0069	0.033	mg/kg		8270C	01/19/11	1
Fluorene	U	0.0059	0.033	mg/kg		8270C	01/19/11	1
Indeno(1,2,3-cd)pyrene	U	0.0059	0.033	mg/kg		8270C	01/19/11	1
Naphthalene	0.086	0.0074	0.033	mg/kg		8270C	01/19/11	1
Phenanthrene	0.014	0.0067	0.033	mg/kg	J	8270C	01/19/11	1
Pyrene	U	0.0077	0.033	mg/kg		8270C	01/19/11	1
Surrogate Recovery								
Nitrobenzene-d5	76.5			% Rec.		8270C	01/19/11	1
2-Fluorobiphenyl	73.7			% Rec.		8270C	01/19/11	1
p-Terphenyl-d14	56.3			% Rec.		8270C	01/19/11	1

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L497659-02 (PH) - 9.4@20.7c



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# REPORT OF ANALYSIS

Alonzo Hernandez  
OXY USA Inc - Grand Junction, CO  
760 Horizon Dr., Ste. 101  
Grand Junction, CO 81506

January 20, 2011

Date Received : January 18, 2011  
Description : 609-33/608-43-31/697-16A2  
Sample ID : 609-33 3  
Collected By : Jerry David  
Collection Date : 01/15/11 19:00

ESC Sample # : L497659-03  
Site ID :  
Project # :

Parameter	Result	MDL	RDL	Units	Qualifier	Method	Date	Dil.
Chromium, Hexavalent	1.4	0.31	2.0	mg/kg	J	3060A/7	01/18/11	1
Chromium, Trivalent	9.1	0.17	0.50	mg/kg		Calc.	01/19/11	1
ORP	-2.0			mV		2580	01/18/11	1
pH	9.4			su		9045D	01/19/11	1
Sodium Adsorption Ratio	31.					Calc.	01/19/11	1
Specific Conductance	1000			umhos/cm		9050AMo	01/19/11	1
Mercury	0.013	0.0015	0.020	mg/kg	J	7471	01/19/11	1
Arsenic	3.8	0.32	1.0	mg/kg		6010B	01/19/11	1
Barium	220	0.050	0.25	mg/kg		6010B	01/19/11	1
Cadmium	U	0.040	0.25	mg/kg		6010B	01/19/11	1
Chromium	10.	0.085	0.50	mg/kg		6010B	01/19/11	1
Copper	9.2	0.21	1.0	mg/kg		6010B	01/19/11	1
Lead	10.	0.090	0.25	mg/kg		6010B	01/19/11	1
Nickel	7.9	0.26	1.0	mg/kg		6010B	01/19/11	1
Selenium	U	0.32	1.0	mg/kg		6010B	01/19/11	1
Silver	U	0.16	0.50	mg/kg		6010B	01/19/11	1
Zinc	25.	0.34	1.5	mg/kg		6010B	01/19/11	1
Benzene	0.0087	0.00090	0.0025	mg/kg		8021/80	01/18/11	5
Toluene	0.039	0.0015	0.025	mg/kg		8021/80	01/18/11	5
Ethylbenzene	0.018	0.0013	0.0025	mg/kg	B	8021/80	01/18/11	5
Total Xylene	0.13	0.0028	0.0075	mg/kg		8021/80	01/18/11	5
TPH (GC/FID) Low Fraction	2.8	0.14	0.50	mg/kg		GRO	01/18/11	5
Surrogate Recovery-%								
a,a,a-Trifluorotoluene (FID)	102.			% Rec.		8021/80	01/18/11	5
a,a,a-Trifluorotoluene (PID)	96.5			% Rec.		8021/80	01/18/11	5
TPH (GC/FID) High Fraction	24.	0.77	4.0	mg/kg		3546/DR	01/19/11	1
Surrogate recovery(%)								
o-Terphenyl	85.8			% Rec.		3546/DR	01/19/11	1
Polynuclear Aromatic Hydrocarbons								
Anthracene	U	0.0082	0.033	mg/kg		8270C	01/19/11	1
Acenaphthene	U	0.0082	0.033	mg/kg		8270C	01/19/11	1
Acenaphthylene	U	0.0078	0.033	mg/kg		8270C	01/19/11	1
Benzo(a)anthracene	U	0.0077	0.033	mg/kg		8270C	01/19/11	1

U = ND (Not Detected)

MDL = Minimum Detection Limit = LOD

RDL = Reported Detection Limit = LOQ = PQL = EQL

Note:

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L497659-03 (PH) - 9.4@20.3c



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Est. 1970

# REPORT OF ANALYSIS

Alonzo Hernandez  
OXY USA Inc - Grand Junction, CO  
760 Horizon Dr., Ste. 101  
Grand Junction, CO 81506

January 20, 2011

Date Received : January 18, 2011  
Description : 609-33/608-43-31/697-16A2  
  
Sample ID : 609-33 3  
  
Collected By : Jerry David  
Collection Date : 01/15/11 19:00

ESC Sample # : L497659-03

Site ID :

Project # :

Parameter	Result	MDL	RDL	Units	Qualifier	Method	Date	Dil.
Benzo(a)pyrene	U	0.0073	0.033	mg/kg		8270C	01/19/11	1
Benzo(b)fluoranthene	U	0.0086	0.033	mg/kg		8270C	01/19/11	1
Benzo(g,h,i)perylene	U	0.0050	0.033	mg/kg		8270C	01/19/11	1
Benzo(k)fluoranthene	U	0.0074	0.033	mg/kg		8270C	01/19/11	1
Chrysene	U	0.0067	0.033	mg/kg		8270C	01/19/11	1
Dibenz(a,h)anthracene	U	0.0058	0.033	mg/kg		8270C	01/19/11	1
Fluoranthene	U	0.0069	0.033	mg/kg		8270C	01/19/11	1
Fluorene	U	0.0059	0.033	mg/kg		8270C	01/19/11	1
Indeno(1,2,3-cd)pyrene	U	0.0059	0.033	mg/kg		8270C	01/19/11	1
Naphthalene	0.067	0.0074	0.033	mg/kg		8270C	01/19/11	1
Phenanthrene	0.010	0.0067	0.033	mg/kg	J	8270C	01/19/11	1
Pyrene	U	0.0077	0.033	mg/kg		8270C	01/19/11	1
Surrogate Recovery								
Nitrobenzene-d5	71.6			% Rec.		8270C	01/19/11	1
2-Fluorobiphenyl	74.1			% Rec.		8270C	01/19/11	1
p-Terphenyl-d14	56.4			% Rec.		8270C	01/19/11	1

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L497659-03 (PH) - 9.4@20.3c



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# REPORT OF ANALYSIS

Alonzo Hernandez  
OXY USA Inc - Grand Junction, CO  
760 Horizon Dr., Ste. 101  
Grand Junction, CO 81506

January 20, 2011

Date Received : January 18, 2011  
Description : 609-33/608-43-31/697-16A2  
Sample ID : 608-43-31 1  
Collected By : Jerry David  
Collection Date : 01/15/11 20:00

ESC Sample # : L497659-04

Site ID :

Project # :

Parameter	Result	MDL	RDL	Units	Qualifier	Method	Date	Dil.
Chromium, Hexavalent	1.1	0.31	2.0	mg/kg	J	3060A/7	01/18/11	1
Chromium, Trivalent	15.	0.17	0.50	mg/kg		Calc.	01/19/11	1
ORP	-3.0			mV		2580	01/18/11	1
pH	9.1			su		9045D	01/19/11	1
Sodium Adsorption Ratio	52.					Calc.	01/19/11	1
Specific Conductance	1900			umhos/cm		9050AMo	01/19/11	1
Mercury	0.0095	0.0015	0.020	mg/kg	J	7471	01/19/11	1
Arsenic	9.9	1.6	5.0	mg/kg		6010B	01/20/11	5
Barium	260	0.25	1.3	mg/kg		6010B	01/20/11	5
Cadmium	U	0.20	1.3	mg/kg	O	6010B	01/20/11	5
Chromium	16.	0.085	0.50	mg/kg		6010B	01/19/11	1
Copper	16.	0.21	1.0	mg/kg		6010B	01/19/11	1
Lead	14.	0.45	1.3	mg/kg		6010B	01/20/11	5
Nickel	11.	0.26	1.0	mg/kg		6010B	01/19/11	1
Selenium	U	0.32	1.0	mg/kg		6010B	01/19/11	1
Silver	U	0.16	0.50	mg/kg		6010B	01/19/11	1
Zinc	33.	0.34	1.5	mg/kg		6010B	01/19/11	1
Benzene	0.025	0.00090	0.0025	mg/kg		8021/80	01/18/11	5
Toluene	0.086	0.0015	0.025	mg/kg		8021/80	01/18/11	5
Ethylbenzene	0.025	0.0013	0.0025	mg/kg	B	8021/80	01/18/11	5
Total Xylene	0.16	0.0028	0.0075	mg/kg		8021/80	01/18/11	5
TPH (GC/FID) Low Fraction	4.6	0.14	0.50	mg/kg		GRO	01/18/11	5
Surrogate Recovery-%								
a,a,a-Trifluorotoluene (FID)	102.			% Rec.		8021/80	01/18/11	5
a,a,a-Trifluorotoluene (PID)	97.0			% Rec.		8021/80	01/18/11	5
TPH (GC/FID) High Fraction	290	0.77	4.0	mg/kg		3546/DR	01/19/11	1
Surrogate recovery(%)								
o-Terphenyl	2270			% Rec.	J1	3546/DR	01/19/11	1
Polynuclear Aromatic Hydrocarbons								
Anthracene	U	0.0082	0.033	mg/kg		8270C	01/19/11	1
Acenaphthene	U	0.0082	0.033	mg/kg		8270C	01/19/11	1
Acenaphthylene	U	0.0078	0.033	mg/kg		8270C	01/19/11	1
Benzo(a)anthracene	U	0.0077	0.033	mg/kg		8270C	01/19/11	1

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Reported: 01/20/11 15:30 Printed: 01/20/11 15:30

L497659-04 (PH) - 9.1@20.3c

L497659-04 (DRO) - Previous run also had high SURR recovery. Matrix effect.



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REPORT OF ANALYSIS

Alonzo Hernandez  
OXY USA Inc - Grand Junction, CO  
760 Horizon Dr., Ste. 101  
Grand Junction, CO 81506

January 20, 2011

Date Received : January 18, 2011  
Description : 609-33/608-43-31/697-16A2

ESC Sample # : L497659-04

Sample ID : 608-43-31 1

Site ID :

Collected By : Jerry David  
Collection Date : 01/15/11 20:00

Project # :

Parameter	Result	MDL	RDL	Units	Qualifier	Method	Date	Dil.
Benzo(a)pyrene	U	0.0073	0.033	mg/kg		8270C	01/19/11	1
Benzo(b)fluoranthene	U	0.0086	0.033	mg/kg		8270C	01/19/11	1
Benzo(g,h,i)perylene	U	0.0050	0.033	mg/kg		8270C	01/19/11	1
Benzo(k)fluoranthene	U	0.0074	0.033	mg/kg		8270C	01/19/11	1
Chrysene	U	0.0067	0.033	mg/kg		8270C	01/19/11	1
Dibenz(a,h)anthracene	U	0.0058	0.033	mg/kg		8270C	01/19/11	1
Fluoranthene	U	0.0069	0.033	mg/kg		8270C	01/19/11	1
Fluorene	U	0.0059	0.033	mg/kg		8270C	01/19/11	1
Indeno(1,2,3-cd)pyrene	U	0.0059	0.033	mg/kg		8270C	01/19/11	1
Naphthalene	0.047	0.0074	0.033	mg/kg		8270C	01/19/11	1
Phenanthrene	U	0.0067	0.033	mg/kg		8270C	01/19/11	1
Pyrene	U	0.0077	0.033	mg/kg		8270C	01/19/11	1
Surrogate Recovery								
Nitrobenzene-d5	73.5			% Rec.		8270C	01/19/11	1
2-Fluorobiphenyl	69.6			% Rec.		8270C	01/19/11	1
p-Terphenyl-d14	113.			% Rec.		8270C	01/19/11	1

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L497659-04 (PH) - 9.1@20.3c

L497659-04 (DRO) - Previous run also had high SURR recovery. Matrix effect.



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# REPORT OF ANALYSIS

Alonzo Hernandez  
OXY USA Inc - Grand Junction, CO  
760 Horizon Dr., Ste. 101  
Grand Junction, CO 81506

January 20, 2011

Date Received : January 18, 2011  
Description : 609-33/608-43-31/697-16A2

ESC Sample # : L497659-05

Sample ID : 608-43-31 2

Site ID :

Collected By : Jerry David  
Collection Date : 01/15/11 20:00

Project # :

Parameter	Result	MDL	RDL	Units	Qualifier	Method	Date	Dil.
Chromium, Hexavalent	1.4	0.31	2.0	mg/kg	JJ3	3060A/7	01/18/11	1
Chromium, Trivalent	17.	0.17	0.50	mg/kg		Calc.	01/19/11	1
ORP	-6.0			mV		2580	01/18/11	1
pH	9.2			su		9045D	01/19/11	1
Sodium Adsorption Ratio	27.					Calc.	01/19/11	1
Specific Conductance	1900			umhos/cm		9050AMo	01/19/11	1
Mercury	0.010	0.0015	0.020	mg/kg	J	7471	01/19/11	1
Arsenic	10.	1.6	5.0	mg/kg		6010B	01/20/11	5
Barium	260	0.25	1.3	mg/kg		6010B	01/20/11	5
Cadmium	U	0.20	1.3	mg/kg	O	6010B	01/20/11	5
Chromium	18.	0.085	0.50	mg/kg		6010B	01/19/11	1
Copper	16.	0.21	1.0	mg/kg		6010B	01/19/11	1
Lead	14.	0.45	1.3	mg/kg		6010B	01/20/11	5
Nickel	11.	0.26	1.0	mg/kg		6010B	01/19/11	1
Selenium	U	0.32	1.0	mg/kg		6010B	01/19/11	1
Silver	U	0.16	0.50	mg/kg		6010B	01/19/11	1
Zinc	38.	0.34	1.5	mg/kg		6010B	01/19/11	1
Benzene	0.029	0.00090	0.0025	mg/kg		8021/80	01/18/11	5
Toluene	0.10	0.0015	0.025	mg/kg		8021/80	01/18/11	5
Ethylbenzene	0.026	0.0013	0.0025	mg/kg	B	8021/80	01/18/11	5
Total Xylene	0.17	0.0028	0.0075	mg/kg		8021/80	01/18/11	5
TPH (GC/FID) Low Fraction	3.8	0.14	0.50	mg/kg		GRO	01/18/11	5
Surrogate Recovery-%								
a,a,a-Trifluorotoluene(FID)	100.			% Rec.		8021/80	01/18/11	5
a,a,a-Trifluorotoluene(PID)	95.6			% Rec.		8021/80	01/18/11	5
TPH (GC/FID) High Fraction	290	0.77	4.0	mg/kg		3546/DR	01/19/11	1
Surrogate recovery(%)								
o-Terphenyl	2410			% Rec.	J1	3546/DR	01/19/11	1
Polynuclear Aromatic Hydrocarbons								
Anthracene	U	0.0082	0.033	mg/kg		8270C	01/19/11	1
Acenaphthene	U	0.0082	0.033	mg/kg		8270C	01/19/11	1
Acenaphthylene	U	0.0078	0.033	mg/kg		8270C	01/19/11	1
Benzo(a)anthracene	U	0.0077	0.033	mg/kg		8270C	01/19/11	1

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L497659-05 (DRO) - Previous run also had high SURR recovery. Matrix effect.

L497659-05 (PH) - 9.2@20.3c





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# REPORT OF ANALYSIS

Alonzo Hernandez  
OXY USA Inc - Grand Junction, CO  
760 Horizon Dr., Ste. 101  
Grand Junction, CO 81506

January 20, 2011

Date Received : January 18, 2011  
Description : 609-33/608-43-31/697-16A2

ESC Sample # : L497659-05

Sample ID : 608-43-31 2

Site ID :

Collected By : Jerry David  
Collection Date : 01/15/11 20:00

Project # :

Parameter	Result	MDL	RDL	Units	Qualifier	Method	Date	Dil.
Benzo(a)pyrene	U	0.0073	0.033	mg/kg		8270C	01/19/11	1
Benzo(b)fluoranthene	U	0.0086	0.033	mg/kg		8270C	01/19/11	1
Benzo(g,h,i)perylene	U	0.0050	0.033	mg/kg		8270C	01/19/11	1
Benzo(k)fluoranthene	U	0.0074	0.033	mg/kg		8270C	01/19/11	1
Chrysene	U	0.0067	0.033	mg/kg		8270C	01/19/11	1
Dibenz(a,h)anthracene	U	0.0058	0.033	mg/kg		8270C	01/19/11	1
Fluoranthene	U	0.0069	0.033	mg/kg		8270C	01/19/11	1
Fluorene	U	0.0059	0.033	mg/kg		8270C	01/19/11	1
Indeno(1,2,3-cd)pyrene	U	0.0059	0.033	mg/kg		8270C	01/19/11	1
Naphthalene	0.059	0.0074	0.033	mg/kg		8270C	01/19/11	1
Phenanthrene	U	0.0067	0.033	mg/kg		8270C	01/19/11	1
Pyrene	U	0.0077	0.033	mg/kg		8270C	01/19/11	1
Surrogate Recovery								
Nitrobenzene-d5	71.6			% Rec.		8270C	01/19/11	1
2-Fluorobiphenyl	66.0			% Rec.		8270C	01/19/11	1
p-Terphenyl-d14	139.			% Rec.		8270C	01/19/11	1

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L497659-05 (DRO) - Previous run also had high SURR recovery. Matrix effect.

L497659-05 (PH) - 9.2020.3c



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# REPORT OF ANALYSIS

Alonzo Hernandez  
OXY USA Inc - Grand Junction, CO  
760 Horizon Dr., Ste. 101  
Grand Junction, CO 81506

January 20, 2011

Date Received : January 18, 2011  
Description : 609-33/608-43-31/697-16A2

ESC Sample # : L497659-06

Sample ID : 608-43-31 3

Site ID :

Collected By : Jerry David  
Collection Date : 01/15/11 20:00

Project # :

Parameter	Result	MDL	RDL	Units	Qualifier	Method	Date	Dil.
Chromium, Hexavalent	1.5	0.31	2.0	mg/kg	J	3060A/7	01/18/11	1
Chromium, Trivalent	16.	0.17	0.50	mg/kg		Calc.	01/19/11	1
ORP	-11.			mV		2580	01/18/11	1
pH	9.2			su		9045D	01/19/11	1
Sodium Adsorption Ratio	55.					Calc.	01/19/11	1
Specific Conductance	1900			umhos/cm		9050AMo	01/19/11	1
Mercury	0.010	0.0015	0.020	mg/kg	J	7471	01/19/11	1
Arsenic	8.6	1.6	5.0	mg/kg		6010B	01/20/11	5
Barium	250	0.25	1.3	mg/kg		6010B	01/20/11	5
Cadmium	U	0.20	1.3	mg/kg	O	6010B	01/20/11	5
Chromium	18.	0.085	0.50	mg/kg		6010B	01/19/11	1
Copper	16.	0.21	1.0	mg/kg		6010B	01/19/11	1
Lead	14.	0.45	1.3	mg/kg		6010B	01/20/11	5
Nickel	13.	0.26	1.0	mg/kg		6010B	01/19/11	1
Selenium	U	0.32	1.0	mg/kg		6010B	01/19/11	1
Silver	U	0.16	0.50	mg/kg		6010B	01/19/11	1
Zinc	32.	0.34	1.5	mg/kg		6010B	01/19/11	1
Benzene	0.022	0.00090	0.0025	mg/kg		8021/80	01/18/11	5
Toluene	0.074	0.0015	0.025	mg/kg		8021/80	01/18/11	5
Ethylbenzene	0.018	0.0013	0.0025	mg/kg		8021/80	01/18/11	5
Total Xylene	0.12	0.0028	0.0075	mg/kg	B	8021/80	01/18/11	5
TPH (GC/FID) Low Fraction	2.0	0.14	0.50	mg/kg		GRO	01/18/11	5
Surrogate Recovery-%								
a,a,a-Trifluorotoluene (FID)	100.			% Rec.		8021/80	01/18/11	5
a,a,a-Trifluorotoluene (PID)	96.3			% Rec.		8021/80	01/18/11	5
TPH (GC/FID) High Fraction	230	0.77	4.0	mg/kg	J5	3546/DR	01/19/11	1
Surrogate recovery(%)								
o-Terphenyl	1880			% Rec.	J1	3546/DR	01/19/11	1
Polynuclear Aromatic Hydrocarbons								
Anthracene	U	0.0082	0.033	mg/kg		8270C	01/19/11	1
Acenaphthene	U	0.0082	0.033	mg/kg		8270C	01/19/11	1
Acenaphthylene	U	0.0078	0.033	mg/kg		8270C	01/19/11	1
Benzo(a)anthracene	U	0.0077	0.033	mg/kg		8270C	01/20/11	1

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Note:

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Reported: 01/20/11 15:30 Printed: 01/20/11 15:30

L497659-06 (PH) - 9.2@20.2c

L497659-06 (DRO) - Previous run also had high SURR recovery. Matrix effect.



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# REPORT OF ANALYSIS

Alonzo Hernandez  
OXY USA Inc - Grand Junction, CO  
760 Horizon Dr., Ste. 101  
Grand Junction, CO 81506

January 20, 2011

Date Received : January 18, 2011  
Description : 609-33/608-43-31/697-16A2

ESC Sample # : L497659-06

Sample ID : 608-43-31 3

Site ID :

Collected By : Jerry David  
Collection Date : 01/15/11 20:00

Project # :

Parameter	Result	MDL	RDL	Units	Qualifier	Method	Date	Dil.
Benzo(a)pyrene	U	0.0073	0.033	mg/kg		8270C	01/20/11	1
Benzo(b)fluoranthene	U	0.0086	0.033	mg/kg		8270C	01/20/11	1
Benzo(g,h,i)perylene	U	0.0050	0.033	mg/kg		8270C	01/20/11	1
Benzo(k)fluoranthene	U	0.0074	0.033	mg/kg		8270C	01/20/11	1
Chrysene	U	0.0067	0.033	mg/kg		8270C	01/20/11	1
Dibenz(a,h)anthracene	U	0.0058	0.033	mg/kg		8270C	01/20/11	1
Fluoranthene	U	0.0069	0.033	mg/kg		8270C	01/19/11	1
Fluorene	U	0.0059	0.033	mg/kg		8270C	01/19/11	1
Indeno(1,2,3-cd)pyrene	U	0.0059	0.033	mg/kg		8270C	01/20/11	1
Naphthalene	0.060	0.0074	0.033	mg/kg		8270C	01/19/11	1
Phenanthrene	U	0.0067	0.033	mg/kg		8270C	01/19/11	1
Pyrene	U	0.0077	0.033	mg/kg		8270C	01/20/11	1
Surrogate Recovery								
Nitrobenzene-d5	77.5			% Rec.		8270C	01/19/11	1
2-Fluorobiphenyl	72.4			% Rec.		8270C	01/19/11	1
p-Terphenyl-d14	144.			% Rec.		8270C	01/20/11	1

U = ND (Not Detected)

MDL = Minimum Detection Limit = LOD

RDL = Reported Detection Limit = LOQ = PQL = EQL

Note:

The reported analytical results relate only to the sample submitted.

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Reported: 01/20/11 15:30 Printed: 01/20/11 15:30

L497659-06 (PH) - 9.2@20.2c

L497659-06 (DRO) - Previous run also had high SURR recovery. Matrix effect.

Sample Number	Work Group	Sample Type	Analyte	Run ID	Qualifier
L497659-01	WG517610	SAMP	Ethylbenzene	R1542829	B
	WG517315	SAMP	Chromium, Hexavalent	R1542389	J
	WG517636	SAMP	Mercury	R1543530	J
	WG517694	SAMP	Phenanthrene	R1544570	J
L497659-02	WG517610	SAMP	Ethylbenzene	R1542829	B
	WG517315	SAMP	Chromium, Hexavalent	R1542389	J
	WG517636	SAMP	Mercury	R1543530	J
	WG517694	SAMP	Phenanthrene	R1544570	J
L497659-03	WG517610	SAMP	Ethylbenzene	R1542829	B
	WG517315	SAMP	Chromium, Hexavalent	R1542389	J
	WG517636	SAMP	Mercury	R1543530	J
	WG517694	SAMP	Phenanthrene	R1544570	J
L497659-04	WG517610	SAMP	Ethylbenzene	R1542829	B
	WG517658	SAMP	Cadmium	R1544529	O
	WG517795	SAMP	o-Terphenyl	R1544352	J1
	WG517315	SAMP	Chromium, Hexavalent	R1542389	J
L497659-05	WG517636	SAMP	Mercury	R1543530	J
	WG517610	SAMP	Ethylbenzene	R1542829	B
	WG517658	SAMP	Cadmium	R1544529	O
	WG517795	SAMP	o-Terphenyl	R1544352	J1
L497659-06	WG517315	SAMP	Chromium, Hexavalent	R1542389	JJ3
	WG517636	SAMP	Mercury	R1543530	J
	WG517610	SAMP	Total Xylene	R1542829	B
	WG517658	SAMP	Cadmium	R1544529	O
L497659-07	WG517795	SAMP	TPH (GC/FID) High Fraction	R1544352	J5
	WG517795	SAMP	o-Terphenyl	R1544352	J1
	WG517315	SAMP	Chromium, Hexavalent	R1542389	J
	WG517636	SAMP	Mercury	R1543530	J
L497659-08	WG517610	SAMP	Toluene	R1542829	J
	WG517610	SAMP	Total Xylene	R1542829	B
	WG517658	SAMP	Selenium	R1544529	O
	WG517658	SAMP	Silver	R1544529	J
L497659-09	WG517795	SAMP	o-Terphenyl	R1544352	J1
	WG517315	SAMP	Chromium, Hexavalent	R1542389	J
	WG517694	SAMP	Fluorene	R1544570	J
	WG517694	SAMP	Phenanthrene	R1544570	J
L497659-10	WG517694	SAMP	p-Terphenyl-d14	R1544570	J1
	WG517610	SAMP	Ethylbenzene	R1542829	B
	WG517658	SAMP	Selenium	R1544529	O
	WG517658	SAMP	Silver	R1544529	J
L497659-11	WG517795	SAMP	o-Terphenyl	R1544352	J1
	WG517315	SAMP	Chromium, Hexavalent	R1542389	J
	WG517694	SAMP	Fluorene	R1544570	J
	WG517694	SAMP	Phenanthrene	R1544570	J
L497659-12	WG517694	SAMP	p-Terphenyl-d14	R1544570	J1
	WG517610	SAMP	Ethylbenzene	R1542829	B
	WG517658	SAMP	Selenium	R1544529	O
	WG517658	SAMP	Silver	R1544529	J
L497659-13	WG517795	SAMP	o-Terphenyl	R1544352	J1
	WG517315	SAMP	Chromium, Hexavalent	R1542389	J
	WG517694	SAMP	Fluorene	R1544570	J
	WG517694	SAMP	Phenanthrene	R1544570	J
L497659-14	WG517694	SAMP	p-Terphenyl-d14	R1544570	J1
	WG517610	SAMP	Ethylbenzene	R1542829	B
	WG517658	SAMP	Selenium	R1544529	O
	WG517658	SAMP	Silver	R1544529	J
L497659-15	WG517795	SAMP	o-Terphenyl	R1544352	J1
	WG517315	SAMP	Chromium, Hexavalent	R1542389	J
	WG517694	SAMP	Fluorene	R1544570	J
	WG517694	SAMP	Phenanthrene	R1544570	J
L497659-16	WG517694	SAMP	p-Terphenyl-d14	R1544570	J1
	WG517610	SAMP	Ethylbenzene	R1542829	B
	WG517658	SAMP	Selenium	R1544529	O
	WG517658	SAMP	Silver	R1544529	J
L497659-17	WG517795	SAMP			

Attachment B  
Explanation of QC Qualifier Codes

Qualifier	Meaning
B	(EPA) - The indicated compound was found in the associated method blank as well as the laboratory sample.
J	(EPA) - Estimated value below the lowest calibration point. Confidence correlates with concentration.
J1	Surrogate recovery limits have been exceeded; values are outside upper control limits
J5	The sample matrix interfered with the ability to make any accurate determination; spike value is high
J3	The associated batch QC was outside the established quality control range for precision.
O	(ESC) Sample diluted due to matrix interferences that impaired the ability to make an accurate analytical determination. The detection limit is elevated in order to reflect the necessary dilution.

Qualifier Report Information

ESC utilizes sample and result qualifiers as set forth by the EPA Contract Laboratory Program and as required by most certifying bodies including NELAP. In addition to the EPA qualifiers adopted by ESC, we have implemented ESC qualifiers to provide more information pertaining to our analytical results. Each qualifier is designated in the qualifier explanation as either EPA or ESC. Data qualifiers are intended to provide the ESC client with more detailed information concerning the potential bias of reported data. Because of the wide range of constituents and variety of matrices incorporated by most EPA methods, it is common for some compounds to fall outside of established ranges. These exceptions are evaluated and all reported data is valid and useable "unless qualified as 'R' (Rejected)."

Definitions

- Accuracy** - The relationship of the observed value of a known sample to the true value of a known sample. Represented by percent recovery and relevant to samples such as: control samples, matrix spike recoveries, surrogate recoveries, etc.
- Precision** - The agreement between a set of samples or between duplicate samples. Relates to how close together the results are and is represented by Relative Percent Difference.
- Surrogate** - Organic compounds that are similar in chemical composition, extraction, and chromatography to analytes of interest. The surrogates are used to determine the probable response of the group of analytes that are chemically related to the surrogate compound. Surrogates are added to the sample and carried through all stages of preparation and analyses.
- TIC** - Tentatively Identified Compound: Compounds detected in samples that are not target compounds, internal standards, system monitoring compounds, or surrogates.

Summary of Remarks For Samples Printed  
01/20/11 at 15:30:52

TSR Signing Reports: 134  
R3 - Rush: Two Day

Sample: L497659-01 Account: OXYGJCO Received: 01/18/11 08:30 Due Date: 01/20/11 00:00 RPT Date: 01/20/11 15:30  
Sample: L497659-02 Account: OXYGJCO Received: 01/18/11 08:30 Due Date: 01/20/11 00:00 RPT Date: 01/20/11 15:30  
Sample: L497659-03 Account: OXYGJCO Received: 01/18/11 08:30 Due Date: 01/20/11 00:00 RPT Date: 01/20/11 15:30  
Sample: L497659-04 Account: OXYGJCO Received: 01/18/11 08:30 Due Date: 01/20/11 00:00 RPT Date: 01/20/11 15:30  
Sample: L497659-05 Account: OXYGJCO Received: 01/18/11 08:30 Due Date: 01/20/11 00:00 RPT Date: 01/20/11 15:30  
Sample: L497659-06 Account: OXYGJCO Received: 01/18/11 08:30 Due Date: 01/20/11 00:00 RPT Date: 01/20/11 15:30  
Sample: L497659-07 Account: OXYGJCO Received: 01/18/11 08:30 Due Date: 01/20/11 00:00 RPT Date: 01/20/11 15:30  
Sample: L497659-08 Account: OXYGJCO Received: 01/18/11 08:30 Due Date: 01/20/11 00:00 RPT Date: 01/20/11 15:30  
Sample: L497659-09 Account: OXYGJCO Received: 01/18/11 08:30 Due Date: 01/20/11 00:00 RPT Date: 01/20/11 15:30



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**HYDROGEOLOGIC REPORT  
OXY CASCADE CANYON  
#609-14 WELL PAD**

January 21, 2011

**WALSH Project Number: 900546.0005.010**



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Environmental Scientists and Engineers, LLC



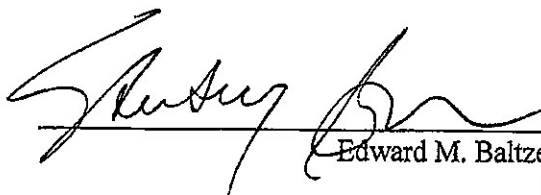
Environmental Scientists and Engineers, LLC

# HYDROGEOLOGIC REPORT OXY CASCADE CANYON #609-14 WELL PAD

January 21, 2011

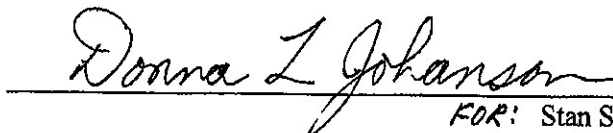
Prepared for: **OXY USA WTP LP**  
760 Horizon Drive  
Suite 101  
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Prepared by:



Edward M. Baltzer, CPG, CHMM  
Project Manager

Reviewed by:



FOR: Stan Spencer  
Principal Hydrogeologist

*Submitted by*  
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535 Grand Avenue  
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WALSH Project Number: 900546.0005.010



## TABLE OF CONTENTS

<b>1</b>	<b>INTRODUCTION.....</b>	<b>1</b>
<b>2</b>	<b>GEOLOGY AND HYDROLOGY.....</b>	<b>1</b>
2.1	REGIONAL GEOLOGY .....	1
2.2	SITE GEOLOGY.....	1
2.3	SITE SOIL .....	2
2.4	SITE HYDROLOGY .....	2
2.4.1	<i>Alluvial Aquifer.....</i>	2
2.4.2	<i>Upper Piceance Basin Aquifer.....</i>	2
2.4.3	<i>Deeper Aquifers .....</i>	3
2.4.4	<i>Floodplain.....</i>	3
2.4.5	<i>Aquifer Water Quality.....</i>	3
2.5	REGISTERED WELLS IN THE AREA .....	3
<b>3</b>	<b>ENVIRONMENTAL IMPACT.....</b>	<b>3</b>
3.1	CUTTING CHARACTERISTICS.....	3
3.2	CUTTING PLACEMENT.....	4
3.3	POTENTIAL GROUNDWATER PATHWAY .....	4
3.4	POTENTIAL IMPACTS TO AQUIFER.....	4
3.5	HYDROLOGIC MONITORING .....	5
<b>4</b>	<b>REFERENCES.....</b>	<b>5</b>

## LIST OF APPENDICES

APPENDIX A – FIGURE AND TABLE

APPENDIX B – LABORATORY ANALYTICAL DATA

# **HYDROGEOLOGIC REPORT OXY CASCADE CANYON #609-14 WELL PAD**

## **1 INTRODUCTION**

This hydrologic report was prepared by Walsh Environmental Scientists & Engineers, LLC (Walsh), on behalf of OXY USA WTP LP (Oxy) to define potential impacts to surface water and groundwater by proposed drill cutting disposal at the Cascade Creek #609-14 well pad. Specifically this report provides information requested in Sections 980b(7) A and B, 988b(9) A and B, and 908b(10) of the Colorado Oil and Gas Conservation Commission (COGCC) Rules and Regulations as amended April 1, 2009.

## **2 GEOLOGY AND HYDROLOGY**

The following sections are summaries of the geology, hydrology, physical characteristics, and baseline information on the study area obtained from published information, OXY reports, and field inspections.

### **2.1 Regional Geology**

The site is located in the west-central part of Colorado on the Colorado Plateau, southwest of the White River geological uplift. Tertiary basalt flows cover much of the area south of the Colorado River. Land both south and north of the Colorado River contains bedrock of Cenozoic age including the Parachute Creek Member of the Green River Formation, which is an oil shale unit about 900 to 1,200 feet thick in this area. It consists of black, dark-brown, and dark gray, commonly laminated marlstone, which weathers to a light gray. The upper part of the member contains the thickest and richest oil-shale beds. The 2-6 foot thick Mahogany bed is a persistent bed of very rich oil shale within the Mahogany zone, which forms a sheer 80-100 foot thick cliff or ledge of rich oil shale within the upper part of the Parachute Creek Member. Cliffs in the site area are capped by the Parachute Creek Member.

Glacial deposits are widely distributed throughout the upland areas, and alluvium and stream-laid gravel and boulders form a broad belt along the Colorado River and its tributaries [U.S. Department of Agriculture, Soil Conservation Service (USDA, 1988)]. The site is located just west of the Grand Hogback which separates the Colorado Plateau physiographic province from the White River Plateau to the northeast and the Sawatch Range to the southeast (Tweto, 1979). The Colorado Plateau is a relatively stable shelf area with no major mountain building episodes since the late Precambrian. It contains thick sequences of sedimentary rocks ranging in age from the late Paleozoic through the Tertiary period (Press and Siever, 1974). The Colorado Plateau is punctuated with areas of Tertiary volcanic activity expressed by extrusive igneous deposits.

### **2.2 Site Geology**

Bedrock at the site consists of the Tertiary-aged lowermost Uinta Formation (sandstones and siltstones) and/or the upper Parachute Creek Member. The Parachute Creek Member in turn overlies the Tertiary-aged Wasatch and Ohio Creek formations, which outcrop in the lower valleys.

These formations consist of siltstone, sandstone, claystone, and conglomerate. Bedrock exposed at the site appears as a gray marlstone or shale, with portions that are massive, fractured, and fissile. The bedrock at the site is partially covered by alluvium and colluvium. This material is likely to be up to ten or more feet thick and will likely contain unconfined groundwater. Colluvium exposed in roadcuts and excavations appears as a thin layer of cobbles in a sandy or loamy soil matrix on hill slopes grading into a thicker layer of fine alluvium near the bases of slopes. Streams in the area frequently have bedrock floors indicating an erosional environment.

### **2.3 Site Soil**

Soil at the site is mapped as the Parachute-Rhone loams, 5-30% slopes. The Parachute soil is moderately deep and well drained and is formed in residuum derived dominantly from sandstone or hard siltstone. It has 10 inches of grayish brown loam overlying up to 15 inches of very channery loam overlying rippable fractured siltstone. The Rhone loam is a deep-well-drained soil formed in colluvium derived from sandstone and shale. It is very dark grayish brown loam to 10 inches overlying grayish brown channery loam to 39 inches, overlying brown very channery loam to 55 inches overlying rippable, fractured siltstone (USDA, 1988).

### **2.4 Site Hydrology**

Hydrology at the site consists of small intermittent or ephemeral drainages in the higher elevations that coalesce into larger drainages in the valley floors. The study area is on a plateau that is about 9,000 feet above mean sea level at its highest points, with the study area between 8,360 and 8,480 feet above mean sea level (Figure 1). A small, unnamed, intermittent tributary to Conn Canyon is the predominant hydrologic feature near the site.

The proposed disposal cell is located at least 200 feet above the uppermost aquifer, and is separated from it by loam soil and fractured bedrock. The nearest ephemeral stream is about 900 feet horizontally to the south and about 200 feet vertically below the pad. The nearest perennial surface water is a stock pond constructed at a spring about 0.5 miles south-southwest of the pad, although the stream channel between the pad and the stock pond has intermittent flow.

#### **2.4.1 Alluvial Aquifer**

Meteoric water is likely to infiltrate initially into the vadose zone and form localized and in some cases intermittent aquifers in the unconsolidated alluvium. This water is expected to be tributary to springs, creeks, and the underlying shallow aquifer.

Walsh conducted tracer dye tests at a steep nearby location with similar geologic and hydrologic properties (Walsh, 2009). The groundwater velocity in what is likely to be an alluvial aquifer was measured to be 91 to 212 feet per day under saturated hydrologic conditions.

#### **2.4.2 Upper Piceance Basin Aquifer**

The hydrology of the Piceance Basin is described in the *Groundwater Atlas of Colorado* (CGS, 2003). This report defines the Upper Piceance Basin aquifer in the Uinta Formation. It is found in the sandstones, fractures in the siltstone and marlstone, and in solution cavities and is perched above the Mahogany confining unit. The aquifer has a measured hydraulic conductivity of 0.8 to

1.2 feet per day. It is less than 500 feet thick in the study area. The potentiometric contour is shown to be approximately 7,800 to 8,000 feet in the study area. Springs in the vicinity are found generally at about 8,200 feet elevation (Figure 1), suggesting that the actual potentiometric surface is at or near that elevation in the study area. The Mahogany confining unit outcrops as cliffs and has a top elevation of about 8,000 feet in the study area. The flow direction of the uppermost aquifer is generally to the southwest at the study area, although it is towards the north over most of the Roan Plateau (CGS, 2003).

#### **2.4.3 Deeper Aquifers**

Deeper bedrock aquifers exist beneath the site. The uppermost is the lower Piceance Basin aquifer, which has a potentiometric elevation of about 7800 feet and is over 500 feet thick beneath the study area. Its measured hydraulic conductivity is 0.1 to 1.1 feet per day. Beneath this is the Mesaverde aquifer, which has a potentiometric surface of about 6,000 feet in the study area.

#### **2.4.4 Floodplain**

The pit proposed to be used for drill cuttings is located about 250 feet above the bottom of the adjacent ephemeral drainage. The area drained by this drainage upstream from the disposal cell is less than 40 acres. This indicates that the site is not located in or near a floodplain.

#### **2.4.5 Aquifer Water Quality**

The water quality of the uppermost aquifer and/or the alluvial aquifer has been found in the area to be good, with about 350-400 milligrams per liter of total dissolved solids as measured in springs, seeps, and streams (Walsh, 2009). The groundwater expressed as springs is used by livestock and wildlife throughout the Roan Plateau and in the study area.

#### **2.5 Registered Wells in the Area**

Walsh reviewed the Colorado Division of Water Resources' on-line database of water wells registered in the state. There are no registered water wells within one mile of the site (CDWR, 2011). The nearest registered water well is near the center of Section 18, about 1.5 miles southwest of the pad and in a separate drainage basin. The nearest registered well located downgradient from the pad is four miles away and is registered to John W. Savage. Since there are no registered wells within one mile and any potential release from the disposal cell would likely manifest at springs and streams downgradient from the site, no registered monitoring wells will be sampled as part of this project.

### **3 ENVIRONMENTAL IMPACT**

This section discusses the potential environmental impact of the cuttings placed at the site.

#### **3.1 Cutting Characteristics**

Prior to placement, the drill cuttings will be dried such that there is no free water in them. A sample of typical drill cuttings was obtained by Oxy personnel and submitted to Environmental Science Corporation of Mount Juliet, Tennessee for analysis. Laboratory results show that most

target analytes in the cuttings are below the COGCC concentration levels for soils that are to be left on site (Table 1). The exception is arsenic, which was found at 1.5 milligrams per kilogram (mg/kg), which is above the COGCC concentration level, but is consistent with background levels found in the area (2.0 to 4.3 mg/kg), with the laboratory results attached in Appendix B. Polynuclear aromatic hydrocarbons (PAH) were not detected, but the reported detection limit for several PAHs was above the COGCC concentration levels (Table 1). The laboratory reported that the “sample was diluted due to matrix interferences that impaired the ability to make an accurate analytical determination”, and that “the detection limit is elevated in order to reflect the necessary dilution” (see attached laboratory data). It is possible that other samples and/or other laboratory analysis could provide reported detection limits that are below the COGCC concentration levels.

### 3.2 Cutting Placement

The cuttings will be placed into the production pit in twelve-inch layers, with six-inch layers of native soil placed between each layer of cuttings. The purpose of the native soil is to stabilize the cuttings and allow compaction of the material. The production pit is ten feet deep, and material will be placed up against the cut edge of the pad. Once the final grade has been reached, the cuttings will be compacted and a final cap of three feet of native soil will be placed on top of the drill cuttings such that the top of the material has a slope for drainage and to approximately match the local contours. The top twelve inches of the cap will consist of reclaimed topsoil that will be placed without compaction, seeded, and mulched for reclamation. After revegetation has been achieved in accordance with CDPHE Stormwater Regulations, the location will be placed into Oxy’s COGCC Stormwater program for the life of the facility.

### 3.3 Potential Groundwater Pathway

The potential pathway for groundwater to contact the cuttings is for either the cuttings to have been placed into groundwater, or for meteoric water to infiltrate the cuttings and flow through the cuttings, through the vadose zone, and into the alluvial or shallow aquifer(s). The excavated pit bottom is at an elevation of about 8410 feet above sea level, and the nearest surface water expression (likely to be an expression of the alluvial and/or shallow aquifer) is about 8170 feet above sea level. No groundwater or indications of periodic saturation were evident in the excavation. These facts indicate that the cuttings will not be in contact with standing groundwater at any time. Meteoric water theoretically can penetrate the cap and enter into the cuttings, leach contaminants, and enter the aquifer(s). Local precipitation is 20 to 25 inches annually, and is predominantly in the form of winter snowfall. This snowfall rapidly melts in the spring, allowing a short timeframe for infiltration. The remaining precipitation is in the form of summer rain showers, which are generally short-lived and result in rapid runoff and little infiltration, especially on steep slopes. Much of the summer precipitation is transpired by vegetation. The nearest perennial surface water is a stock pond constructed at a spring about 0.5 miles south-southwest of the pad. There may be intermittent surface water in the drainage between the pad and the pond.

### 3.4 Potential Impacts to Aquifer

The top of the cuttings cell will have a cap consisting of native vegetation and will be contoured to facilitate runoff and minimize infiltration. Native vegetation established on the cuttings will transpire infiltrated water, reducing infiltration into the cuttings. The cuttings have measured

analytes below the COGCC Table 910-1 standards or are below background. Some small fraction of the meteoric water could infiltrate into and through the cuttings and affect the aquifer. However, based on the minimal water infiltration, the absence of target contaminants in the cuttings, and the distance vertically from groundwater and horizontally from surface water, any impact to groundwater is expected to be insignificant and/or undetectable.

### 3.5 Hydrologic Monitoring

The drill cuttings have target analyte levels that are below the COGCC standards for burial of exploration and production wastes, and minimal infiltration will reduce the chance for groundwater to contact the buried cuttings. Even though the drill cuttings are not expected to impact the environment, Oxy proposes to monitor surface water at the stock pond and in the unnamed tributary to Conn Creek south of the site for COGCC Table 910-1 water analytes plus field parameters (pH, temperature, and conductivity). Surface water will be monitored quarterly except during the winter, when the difficulty of reaching the site precludes sampling. Several quarterly samples will be obtained prior to cutting disposal in order to establish background levels of target analytes. Water results will be tabulated and water quality will be compared to background levels, and the results maintained in Oxy files for the facility. Analytes that exceed Table 910-1 water standards will be reported to the COGCC.

## 4 REFERENCES

- Colorado Division of Water Resources. On-line. Accessed January 5, 2011. Web address is: <http://water.state.co.us/DataMaps/GISandMaps/Pages/default.aspx>
- Colorado Geological Survey. 2003. *Groundwater Atlas of Colorado*. Special Publication 53. Ralf Topper, Karen Spray, William Bellis, Judith Hamilton, and Peter Barkmann.
- Colorado Oil and Gas Conservation Commission (COGCC). 2009. 900 Series Rules - Exploration and Production Waste Management. <http://cogcc.state.co.us/>
- Press, Frank and Siever, Raymond. 1974. *Earth*. W.H. Freeman and Company, San Francisco.
- Tweto, Ogden. 1979. *Geologic Map of Colorado*.
- United States Department of Agriculture (USDA). 1988. *Soil Survey of the Douglas Plateau Area*.
- Walsh Environmental Scientists and Engineers, LLC. 2009. *Release Characterization and Interim Remedial Action Work Plan, Oxy Cascade Canyon #697-09-61 Well Pad*. Appendix G addendum to COGCC Form 27.

## Appendix A – Figure and Table





OXY USA WTP LP

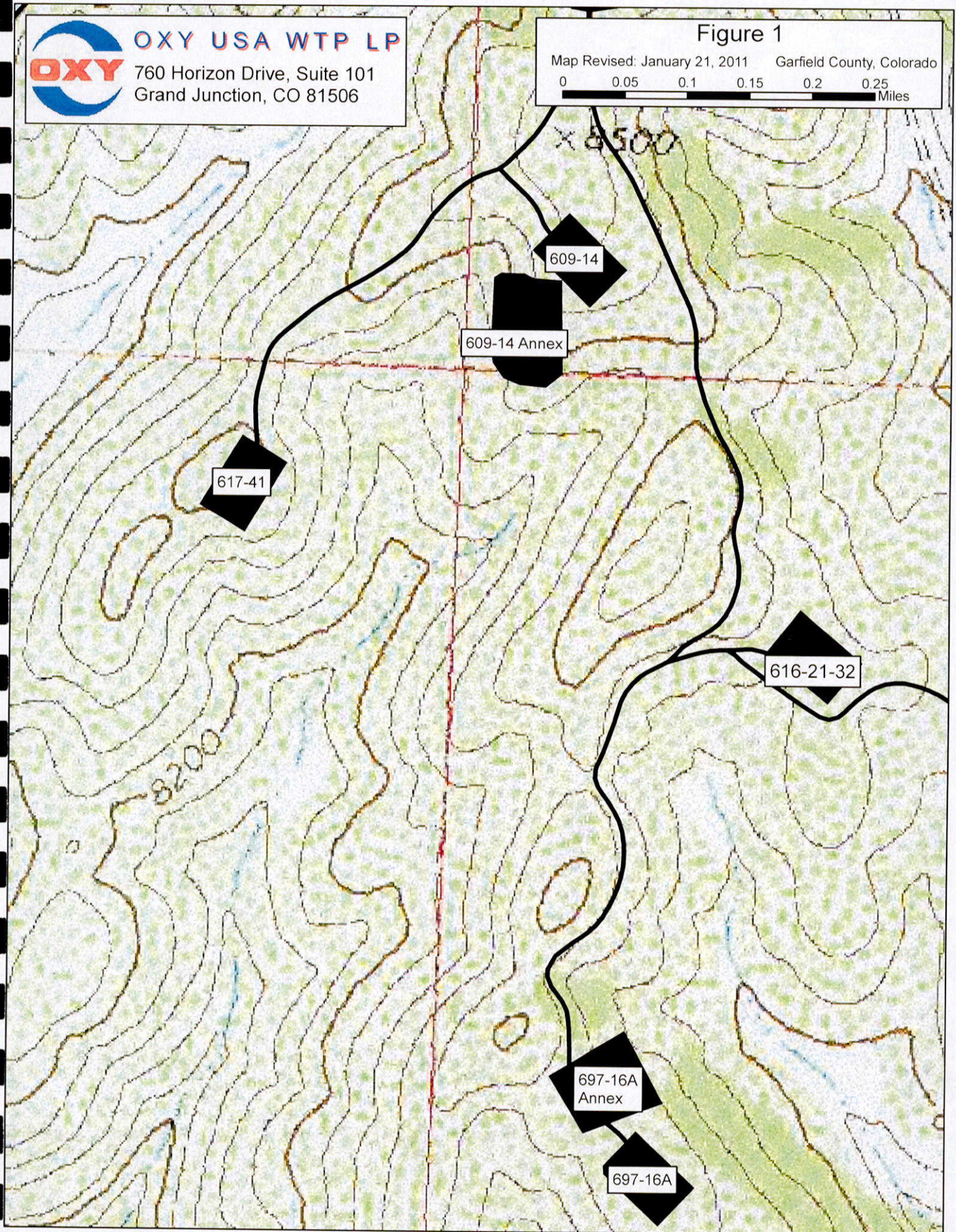
760 Horizon Drive, Suite 101  
Grand Junction, CO 81506

Figure 1

Map Revised: January 21, 2011

Garfield County, Colorado

0 0.05 0.1 0.15 0.2 0.25 Miles





Analyte	COGCC Table 910-1 MCL (mg/kg)	609-14 Cuttings (Dec 23, 2010) (mg/kg)
<b>Organics in Soil</b>		
TPH* (GRO and DRO)	<b>500</b>	270.0
Benzene	<b>0.17</b>	0.02
Toluene	<b>85</b>	0.05
Ethylbenzene	<b>100</b>	0.01
Xylenes	<b>175</b>	0.0950
<b>Organics in Soil (PAH's)</b>		
Acenaphthene	<b>1000</b>	<0.033
Anthracene	<b>1000</b>	<0.033
Benzo(A)anthracene	<b>0.22</b>	<u>&lt;0.33</u>
Benzo(B)fluoranthene	<b>0.22</b>	<u>&lt;0.33</u>
Benzo(K)fluoranthene	<b>2.2</b>	<0.33
Benzo(A)pyrene	<b>0.022</b>	<u>&lt;0.33</u>
Chrysene	<b>22</b>	<0.33
Dibenzo(A,H)anthracene	<b>0.022</b>	<u>&lt;0.33</u>
Fluoranthene	<b>1000</b>	<0.033
Flourene	<b>1000</b>	<0.033
Indeno(1,2,3,C,D)pyrene	<b>0.22</b>	<u>&lt;0.33</u>
Napthalene	<b>23</b>	0.073
Pyrene	<b>1000</b>	<0.33
<b>Inorganics in Soil</b>		
Electrical conductivity	<b>&lt;4 mmhos/cm or 2X background</b>	0.99 (mmhos/cm)
pH	<b>6-9</b>	8.8
Arsenic	<b>0.39</b>	1.5
Barium	<b>15000</b>	300
Cadmium	<b>70</b>	0.09
Chromium	<b>12000</b>	10.0
Chromium VI	<b>23</b>	0.35
Copper	<b>3100</b>	11.0
Lead	<b>400</b>	4.6
Mercury	<b>23</b>	0.004
Nickel	<b>1600</b>	6.3
Selenium	<b>390</b>	<1.0
Silver	<b>390</b>	<0.5
Zinc	<b>23000</b>	39.0

\*Note - only DRO present in TPH

COGCC - Colorado Oil and Gas Conservation Commission

MCL - maximum contaminant level - COGCC Table 910-1 concentration levels

TPH - total petroleum hydrocarbons

GRO - Gasoline-range organics

DRO - diesel-range organics

PAH - polynuclear aromatic hydrocarbons

**BOLD** - indicates analyte above MCL

Ital and underline - MCL below laboratory quantitation level

## Appendix B – Laboratory Analytical Data

Company Name/Address: <b>OXY USA - Grand Junction, CO</b>  760 Horizon Dr.. Ste. 101 Grand Junction.CO 81506				Alternate billing information:				Analysis/Container/Preservative				Chain of Custody Page ___ of ___  Prepared by:  <b>ENVIRONMENTAL SCIENCE CORP.</b> 12065 Lebanon Road Mt. Juliet, TN 37122  Phone (615) 758-5858 Phone (800) 767-5859 FAX (615) 759 5959 <b>A091</b>		
Report to: <b>Brett Kennedy</b>				Email to: <b>brett_kennedy@oxy.com</b>				Please see attached						
Project Description: <b>609-14 Cuttings</b>				City/State Collected										
Phone: <b>(970) 263-3601</b>				Client Project #:										
FAX:				ESC Key:										
Collected by: <b>SAM AUTREY</b>				Site/Facility ID#:										
Collected by (signature): <i>Sam Autrey</i> Immediately Packed on Ice N <input type="checkbox"/> Y <input checked="" type="checkbox"/>				<b>Rush?</b> ( Lab MUST Be Notified ) <input type="checkbox"/> Same Day.....200% <input type="checkbox"/> Next Day.....100% <input type="checkbox"/> Two Day.....50% <input checked="" type="checkbox"/> Three Day.....25%				Date Results Needed: Email? <input type="checkbox"/> No <input checked="" type="checkbox"/> Yes FAX? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes		No. of Cntrs		CoCode: <b>OXYGJCO</b> (lab use only) Template/Prelogin Shipped Via:		
Sample ID		Comp/Grab	Matrix*	Depth	Date	Time					Remarks/Contaminant			Sample # (lab only)
<b>609-14 Cuttings</b>		<b>Grab</b>	<b>SS</b>		<b>12/23/10</b>	<b>7:00</b>	<b>3</b>							<b>609-14-5854-01</b>

\*Matrix: SS - Soil/Solid GW - Groundwater WW - WasteWater DW - Drinking Water OT - Other \_\_\_\_\_

pH \_\_\_\_\_ Temp \_\_\_\_\_

Remarks:

**434193119686** Flow \_\_\_\_\_ Other \_\_\_\_\_

Relinquished by: (Signature) <i>Sam Autrey</i>		Date: <b>12-23-10</b>	Time: <b>8:30</b>	Received by: (Signature) <i>Bl-K R...</i>		Samples returned via: <input checked="" type="checkbox"/> FedEx <input type="checkbox"/> Courier <input type="checkbox"/> UPS		Condition: (lab use only)	
Relinquished by: (Signature) <i>Bl-K R...</i>		Date: <b>12/23/10</b>	Time: <b>1800</b>	Received by: (Signature) <i>Fed Ex</i>		Temp: <b>3.1°C</b>	Bottles Received: <b>3-802</b>	CoC Seals Intact <input checked="" type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> NA	
Relinquished by: (Signature)		Date:	Time:	Received for lab by: (Signature)		Date: <b>12/24/10</b>	Time: <b>0900</b>	pH Checked: <b>NCF</b>	



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Est. 1970

Brett Kennedy  
OXY USA Inc - Grand Junction, CO  
760 Horizon Dr., Ste. 101  
Grand Junction, CO 81506

### Report Summary

Tuesday January 04, 2011

Report Number: L495254

Samples Received: 12/24/10

Client Project:

Description: 609-14 Cuttings

The analytical results in this report are based upon information supplied by you, the client, and are for your exclusive use. If you have any questions regarding this data package, please do not hesitate to call.

Entire Report Reviewed By:

T. Alan Harvill , ESC Representative

### Laboratory Certification Numbers

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT - PH-0197, FL - E87487  
GA - 923, IN - C-TN-01, KY - 90010, KYUST - 0016, NC - ENV375/DW21704, ND - R-140  
NJ - TN002, NJ NELAP - TN002, SC - 84004, TN - 2006, VA - 00109, WV - 233  
AZ - 0612, MN - 047-999-395, NY - 11742, WI - 998093910, NV - TN000032008A,  
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# REPORT OF ANALYSIS

Brett Kennedy  
OXY USA Inc - Grand Junction, CO  
760 Horizon Dr., Ste. 101  
Grand Junction, CO 81506

January 04, 2011

Date Received : December 24, 2010  
Description : 609-14 Cuttings  
  
Sample ID : 609-14 CUTTINGS  
  
Collected By : Sam Autrey  
Collection Date : 12/23/10 07:00

ESC Sample # : L495254-01

Site ID :

Project # :

Parameter	Result	MDL	RDL	Units	Qualifier	Method	Date	Dil.
Chromium, Hexavalent	0.35	0.31	2.0	mg/kg	JP1	3060A/7	12/29/10	1
Chromium, Trivalent	10.	0.17	0.50	mg/kg		Calc.	12/30/10	1
ORP	11.			mV		2580	12/28/10	1
pH	8.8			su		9045D	12/29/10	1
Specific Conductance	990			umhos/cm		9050AMo	12/30/10	1
Mercury	0.0039	0.0015	0.020	mg/kg	J	7471	12/27/10	1
Arsenic	1.5	0.32	1.0	mg/kg		6010B	12/30/10	1
Barium	300	0.050	0.25	mg/kg		6010B	12/30/10	1
Cadmium	0.093	0.040	0.25	mg/kg	J	6010B	12/30/10	1
Chromium	11.	0.085	0.50	mg/kg		6010B	12/30/10	1
Copper	11.	0.21	1.0	mg/kg		6010B	12/30/10	1
Lead	4.6	0.090	0.25	mg/kg		6010B	12/30/10	1
Nickel	6.3	0.26	1.0	mg/kg		6010B	12/30/10	1
Selenium	U	0.32	1.0	mg/kg		6010B	12/30/10	1
Silver	U	0.16	0.50	mg/kg		6010B	12/30/10	1
Zinc	39.	0.34	1.5	mg/kg		6010B	12/30/10	1
TPH (GC/FID) Low Fraction	U	0.25	0.50	mg/kg		8015D/G	12/28/10	5
Surrogate Recovery (70-130)								
a, a, a-Trifluorotoluene (FID)	102.			% Rec.		602/801	12/28/10	5
Benzene	0.020	0.0021	0.0050	mg/kg		8260B	12/25/10	5
Toluene	0.052	0.0017	0.025	mg/kg		8260B	12/25/10	5
Ethylbenzene	0.0080	0.0016	0.0050	mg/kg		8260B	12/25/10	5
Total Xylenes	0.095	0.0023	0.015	mg/kg		8260B	12/25/10	5
Surrogate Recovery								
Toluene-d8	104.			% Rec.		8260B	12/25/10	5
Dibromofluoromethane	102.			% Rec.		8260B	12/25/10	5
a, a, a-Trifluorotoluene	104.			% Rec.		8260B	12/25/10	5
4-Bromofluorobenzene	98.7			% Rec.		8260B	12/25/10	5
TPH (GC/FID) High Fraction	270	15.	80.	mg/kg		3546/DR	12/28/10	20
Surrogate recovery(%)								
o-Terphenyl	0.00			% Rec.	J7	3546/DR	12/28/10	20
Polynuclear Aromatic Hydrocarbons								
Anthracene	U	0.0093	0.033	mg/kg		8270C	12/30/10	1

U = ND (Not Detected)

MDL = Minimum Detection Limit = LOD

RDL = Reported Detection Limit = LOQ = PQL = EQL

Note:

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Reported: 01/04/11 16:15 Printed: 01/04/11 16:30  
L495254-01 (PH) - 8.8@18.4c



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Tax I.D. 62-0814289  
Est. 1970

# REPORT OF ANALYSIS

Brett Kennedy  
OXY USA Inc - Grand Junction, CO  
760 Horizon Dr., Ste. 101  
Grand Junction, CO 81506

January 04, 2011

Date Received : December 24, 2010  
Description : 609-14 Cuttings  
Sample ID : 609-14 CUTTINGS  
Collected By : Sam Autrey  
Collection Date : 12/23/10 07:00

ESC Sample # : L495254-01

Site ID :

Project # :

Parameter	Result	MDL	RDL	Units	Qualifier	Method	Date	Dil.
Acenaphthene	U	0.011	0.033	mg/kg		8270C	12/30/10	1
Acenaphthylene	U	0.011	0.033	mg/kg		8270C	12/30/10	1
Benzo(a)anthracene	U	0.077	0.33	mg/kg	O	8270C	12/30/10	10
Benzo(a)pyrene	U	0.074	0.33	mg/kg	O	8270C	12/30/10	10
Benzo(b)fluoranthene	U	0.078	0.33	mg/kg	O	8270C	12/30/10	10
Benzo(g,h,i)perylene	U	0.095	0.33	mg/kg	O	8270C	12/30/10	10
Benzo(k)fluoranthene	U	0.12	0.33	mg/kg	O	8270C	12/30/10	10
Chrysene	U	0.091	0.33	mg/kg	O	8270C	12/30/10	10
Dibenz(a,h)anthracene	U	0.11	0.33	mg/kg	O	8270C	12/30/10	10
Fluoranthene	U	0.0079	0.033	mg/kg		8270C	12/30/10	1
Fluorene	U	0.0095	0.033	mg/kg		8270C	12/30/10	1
Indeno(1,2,3-cd)pyrene	U	0.11	0.33	mg/kg	O	8270C	12/30/10	10
Naphthalene	0.073	0.016	0.033	mg/kg		8270C	12/30/10	1
Phenanthrene	0.059	0.0073	0.033	mg/kg		8270C	12/30/10	1
Pyrene	U	0.089	0.33	mg/kg	O	8270C	12/30/10	10
Surrogate Recovery								
Nitrobenzene-d5	89.5			% Rec.		8270C	12/30/10	1
2-Fluorobiphenyl	83.6			% Rec.		8270C	12/30/10	1
p-Terphenyl-d14	87.4			% Rec.		8270C	12/30/10	10

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Note:

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Reported: 01/04/11 16:15 Printed: 01/04/11 16:30  
L495254-01 (PH) - 8.8@18.4c

Attachment A  
List of Analytes with QC Qualifiers

Sample Number	Work Group	Sample Type	Analyte	Run ID	Qualifier
L495254-01	WG515076	SAMP	Cadmium	R1521475	J
	WG515028	SAMP	o-Terphenyl	R1517549	J7
	WG515026	SAMP	Chromium, Hexavalent	R1519949	JP1
	WG514996	SAMP	Mercury	R1517149	J
	WG515020	SAMP	Benzo(a)anthracene	R1520830	O
	WG515020	SAMP	Benzo(a)pyrene	R1520830	O
	WG515020	SAMP	Benzo(b)fluoranthene	R1520830	O
	WG515020	SAMP	Benzo(g,h,i)perylene	R1520830	O
	WG515020	SAMP	Benzo(k)fluoranthene	R1520830	O
	WG515020	SAMP	Chrysene	R1520830	O
	WG515020	SAMP	Dibenz(a,h)anthracene	R1520830	O
	WG515020	SAMP	Indeno(1,2,3-cd)pyrene	R1520830	O
	WG515020	SAMP	Pyrene	R1520830	O



Attachment B  
Explanation of QC Qualifier Codes

Qualifier	Meaning
J	(EPA) - Estimated value below the lowest calibration point. Confidence correlates with concentration.
J7	Surrogate recovery limits cannot be evaluated; surrogates were diluted out
P1	RPD value not applicable for sample concentrations less than 5 times the reporting limit.
O	(ESC) Sample diluted due to matrix interferences that impaired the ability to make an accurate analytical determination. The detection limit is elevated in order to reflect the necessary dilution.

Qualifier Report Information

ESC utilizes sample and result qualifiers as set forth by the EPA Contract Laboratory Program and as required by most certifying bodies including NELAC. In addition to the EPA qualifiers adopted by ESC, we have implemented ESC qualifiers to provide more information pertaining to our analytical results. Each qualifier is designated in the qualifier explanation as either EPA or ESC. Data qualifiers are intended to provide the ESC client with more detailed information concerning the potential bias of reported data. Because of the wide range of constituents and variety of matrices incorporated by most EPA methods, it is common for some compounds to fall outside of established ranges. These exceptions are evaluated and all reported data is valid and useable "unless qualified as 'R' (Rejected)."

Definitions

- Accuracy - The relationship of the observed value of a known sample to the true value of a known sample. Represented by percent recovery and relevant to samples such as: control samples, matrix spike recoveries, surrogate recoveries, etc.
- Precision - The agreement between a set of samples or between duplicate samples. Relates to how close together the results are and is represented by Relative Percent Difference.
- Surrogate - Organic compounds that are similar in chemical composition, extraction, and chromatography to analytes of interest. The surrogates are used to determine the probable response of the group of analytes that are chemically related to the surrogate compound. Surrogates are added to the sample and carried through all stages of preparation and analyses.
- TIC - Tentatively Identified Compound: Compounds detected in samples that are not target compounds, internal standards, system monitoring compounds, or surrogates.



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Brett Kennedy  
Oxy USA WTP LP - Grand Junction, CO  
760 Horizon Dr., Ste. 101  
Grand Junction, CO 81506

### Report Summary

Friday December 24, 2010

Report Number: L493786

Samples Received: 12/15/10

Client Project:

Description: 609-14

The analytical results in this report are based upon information supplied by you, the client, and are for your exclusive use. If you have any questions regarding this data package, please do not hesitate to call.

Entire Report Reviewed By:

Mark W. Beasley, ESC Representative

### Laboratory Certification Numbers

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT - PH-0197, FL - E87487  
GA - 923, IN - C-TN-01, KY - 90010, KYUST - 0016, NC - ENV375/DW21704, ND - R-140  
NJ - TN002, NJ NELAP - TN002, SC - 84004, TN - 2006, VA - 00109, WV - 233  
AZ - 0612, MN - 047-999-395, NY - 11742, WI - 998093910, NV - TN000032008A,  
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REPORT OF ANALYSIS

Brett Kennedy  
Oxy USA WTP LP - Grand Junction, CO  
760 Horizon Dr., Ste. 101  
Grand Junction, CO 81506

December 24, 2010

Date Received : December 15, 2010  
Description : 609-14  
Sample ID : 609-14-NB-121310  
Collected By : Jake Harris  
Collection Date : 12/13/10 12:00

ESC Sample # : L493786-01  
Site ID :  
Project # :

Parameter	Result	MDL	RDL	Units	Qualifier	Method	Date	Dil.
pH	6.8			su		9045D	12/18/10	1
Sodium Adsorption Ratio	0.83					Calc.	12/20/10	1
Specific Conductance	35.			umhos/cm		9050AMo	12/20/10	1
Arsenic	3.7	0.32	1.0	mg/kg		6010B	12/22/10	1

U = ND (Not Detected)

MDL = Minimum Detection Limit = LOD

RDL = Reported Detection Limit = LOQ = PQL = EQL

Note:

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L493786-01 (PH) - 6.8@18.0c



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REPORT OF ANALYSIS

December 24, 2010

Brett Kennedy  
Oxy USA WTP LP - Grand Junction, CO  
760 Horizon Dr., Ste. 101  
Grand Junction, CO 81506

Date Received : December 15, 2010  
Description : 609-14  
Sample ID : 609-14-WB-121310  
Collected By : Jake Harris  
Collection Date : 12/13/10 12:10

ESC Sample # : L493786-02

Site ID :

Project # :

Parameter	Result	MDL	RDL	Units	Qualifier	Method	Date	Dil.
pH	6.8			su		9045D	12/18/10	1
Sodium Adsorption Ratio	0.74					Calc.	12/20/10	1
Specific Conductance	40.			umhos/cm		9050AMo	12/20/10	1
Arsenic	4.3	0.32	1.0	mg/kg		6010B	12/22/10	1

U = ND (Not Detected)

MDL = Minimum Detection Limit = LOD

RDL = Reported Detection Limit = LOQ = PQL = EQL

Note:

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Reported: 12/24/10 15:08 Printed: 12/24/10 15:09  
L493786-02 (PH) - 6.8@17.9c



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REPORT OF ANALYSIS

Brett Kennedy  
Oxy USA WTP LP - Grand Junction, CO  
760 Horizon Dr., Ste. 101  
Grand Junction, CO 81506

December 24, 2010

Date Received : December 15, 2010  
Description : 609-14  
Sample ID : 609-14-SB-121310  
Collected By : Jake Harris  
Collection Date : 12/13/10 12:20

ESC Sample # : L493786-03

Site ID :

Project # :

Parameter	Result	MDL	RDL	Units	Qualifier	Method	Date	Dil.
pH	7.0			su		9045D	12/18/10	1
Sodium Adsorption Ratio	0.72					Calc.	12/20/10	1
Specific Conductance	47.			umhos/cm		9050AMo	12/20/10	1
Arsenic	2.0	0.32	1.0	mg/kg		6010B	12/24/10	1

U = ND (Not Detected)

MDL = Minimum Detection Limit = LOD

RDL = Reported Detection Limit = LOQ = PQL = EQL

Note:

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L493786-03 (PH) - 7.0@17.6c



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REPORT OF ANALYSIS

Brett Kennedy  
Oxy USA WTP LP - Grand Junction, CO  
760 Horizon Dr., Ste. 101  
Grand Junction, CO 81506

December 24, 2010

Date Received : December 15, 2010  
Description : 609-14

Sample ID : 609-14-SEB-121310

Collected By : Jake Harris  
Collection Date : 12/13/10 12:30

ESC Sample # : L493786-04

Site ID :

Project # :

Parameter	Result	MDL	RDL	Units	Qualifier	Method	Date	Dil.
pH	6.9			su		9045D	12/18/10	1
Sodium Adsorption Ratio	0.78					Calc.	12/20/10	1
Specific Conductance	63.			umhos/cm		9050AMo	12/20/10	1
Arsenic	2.3	0.32	1.0	mg/kg		6010B	12/24/10	1

U = ND (Not Detected)

MDL = Minimum Detection Limit = LOD

RDL = Reported Detection Limit = LOQ = PQL = EQL

Note:

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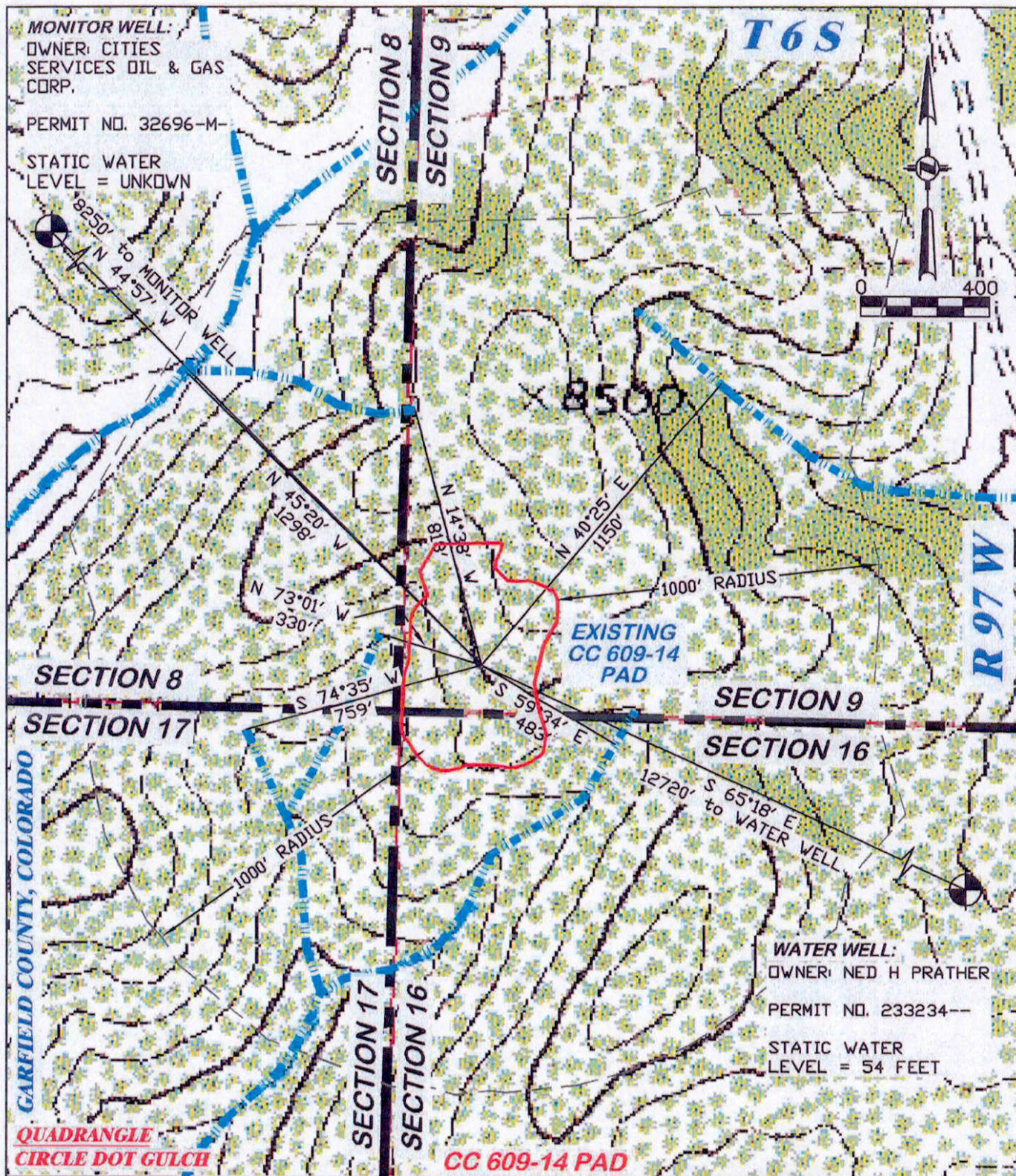
Reported: 12/24/10 15:08 Printed: 12/24/10 15:09  
L493786-04 (PH) - 6.9@17.6c

Summary of Remarks For Samples Printed  
12/24/10 at 15:09:17

TSR Signing Reports: 134  
R5 - Desired TAT

Sample: L493786-01 Account: OXYWTPGJCO Received: 12/15/10 09:00 Due Date: 12/22/10 00:00 RPT Date: 12/24/10 15:08  
Sample: L493786-02 Account: OXYWTPGJCO Received: 12/15/10 09:00 Due Date: 12/22/10 00:00 RPT Date: 12/24/10 15:08  
Sample: L493786-03 Account: OXYWTPGJCO Received: 12/15/10 09:00 Due Date: 12/22/10 00:00 RPT Date: 12/24/10 15:08  
Sample: L493786-04 Account: OXYWTPGJCO Received: 12/15/10 09:00 Due Date: 12/22/10 00:00 RPT Date: 12/24/10 15:08





**RIFFIN & ASSOCIATES, INC.**

(307) 362-5028

1414 ELK ST., ROCK SPRINGS, WY 82901

DRAWN: 12/16/09 - DEH

SCALE: 1" = 400'

REVISED DATE: NA

DRG JOB No. 10841

EXHIBIT 4B

NATURAL CREEK/DRAW

EXISTING ROAD